PROCEEDINGS & TRANSACTIONS

OF THE

CROYDON

NATURAL HISTORY AND SCIENTIFIC SOCIETY.

FEBRUARY 17, 1903, TO JANUARY 19, 1904.

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PROCEEDINGS

OF

THE CROYDON NATURAL HISTORY AND SCIENTIFIC SOCIETY.

1903—1904.

Thirty-fourth Annual Meeting.

Held at the Public Hall, Croydon, January 19th, 1904.

The President, F. Campbell-Bayard, LL.M., F.R.Met.Soc., in the chair.

The Statement of the Accounts for 1903 was approved.

The following gentlemen were elected Officers of the Society for the ensuing year:—

President.—F. Campbell-Bayard, LL.M., F.R.Met.Soc.

Vice-Presidents.—W. Murton Holmes; Edwd. Lovett, F.R.H.S.; Henry T. Mennell, F.L.S.

Hon. Curator of Museum.—N. F. Robarts, F.G.S.

Hon. Lanternist.—J. H. Baldock, F.C.S.

Hon. Librarian.—Alfred Roods.

Hon. Treasurer.—F. J. Townend, 11, Park Hill Rise.

Council.—J. Edmund Clark, B.A., B.Sc., F.G.S.; Dr. T. A. Dukes, B.Sc.; E. A. Martin, F.G.S.; Dr. H. C. Male; T. K. F. Page; Dr. H. Franklin Parsons, F.G.S.; W. Whitaker, F.R.S., F.G.S.

Hon. Secretary.—George W. Moore, 15, Dornton Road, South Croydon.

Anthropological and Archæological Committee.—H. C. Collyer, Breakhurst, Beddington; J. M. Hobson, M.D., B.Sc., Morland Road; A. J. Hogg, 5, Cargreen Road, South Norwood; E. Lovett, F.R.H.S., West Burton, Outram Road; E. A. Martin, F.G.S., 23, Campbell Road; J. Watson Slack, 27, Birdhurst Road; A. Tarver, 7, Stuart Road, Thornton Heath.

Botanical Committee.—J. Edmund Clark, B.A., B.Sc., F.G.S., Lile Garth, Ashburton Road; Miss E. N. Gwatkin, Grove Cottage, Addiscombe Grove; W. Murton Holmes, Glenside, St. Peter's Road; Miss Klaassen (Secretary), Aberfeldy, Campden Road; H. T. Mennell, F.L.S., Park Hill Rise; H. Franklin Parsons, M.D., F.G.S., Oakhyrst, Park Hill Rise; Mrs. Parsons, Oakhyrst, Park Hill Rise; C. E. Salmon, Clevelands, Wray Park, Reigate; E. Straker, 5, Park Lane Mansions.

Geological Committee.—W. Bruce Bannerman, F.S.A., F.G.S., The Lindens, Sydenham Road; G. J. Hinde, Ph.D., F.R.S., F.G.S., Avondale Road; A. J. Hogg, 5, Cargreen Road, South Norwood; W. Murton Holmes, Glenside, St. Peter's Road; Dr. H. C. Male, Cromer Lodge, 74, Birdhurst Road; G. W. Moore, Bryndhurst, Dornton Road; T. K. F. Page, 9, Rosemount, Wallington; H. Franklin Parsons, M.D., F.G.S., Park Hill Rise; N. F. Robarts, F.G.S. (Secretary), 23, Oliver Grove, South Norwood; W. Whitaker, B.A., F.R.S., F.G.S., Freda, Campden Road.

Meteorological Committee.— F. Campbell-Bayard, LL.M., F.R. Met. Soc. (Secretary), Cotswold, Wallington; J. Edmund Clark, B.A., B.Sc., F.G.S., Lile Garth, Ashburton Road; Thos. Cushing, F.R.A.S., Chepstow Road; Baldwin Latham, M.I.C.E., Duppas House.

Microscopical Committee. — Rev. R. K. Corser, 57, Park Hill Road; T. A. Dukes, M.B., B.Sc., 16, Wellesley Road; Mrs. H. Hall, Colleendene, Addiscombe Grove; E. Lovett, F.R.H.S., West Burton, Outram Road; W. Murton Holmes, Glenside, St. Peter's Road; L. Reed, F.C.S., Hyrst Hof, South Park Hill; Miss C. Ward (Secretary), 42, Temple Road.

Museum Committee.—J. M. Hobson, M.D., B.Sc., Morland Road; L. Stanley Jast, Central Library, Town Hall; E. Lovett, F.R.H.S., West Burton, Outram Road; H. T. Mennell, F.L.S., Park Hill Rise; H. Franklin Parsons, M.D., F.G.S., Park Hill Rise; N. F. Robarts, F.G.S. (Secretary), 23, Oliver Grove, South Norwood; W. W. Topley, 46, Friends Road; W. Whitaker, B.A., F.R.S., F.G.S., Freda, Campden Road.

Photographic Committee. — J. H. Baldock, F.C.S. (Lanternist), Overdale, St. Leonard's Road; H. D. Gower (Portfolio Secretary), 55, Benson Road; R. F. Grundy, 8, Havelock Road; A. Roods, 67, Thornhill Road; A. J. Weightman, Endsleigh, 11, Chepstow Road; Dr. J. M. Hobson, 1, Morland Road.

Zoological Committee.—J. H. Baldock, F.C.S., Overdale, St. Leonard's Road; H. D. Gower, 55, Benson Road; W. Murton Holmes, Glenside, St. Peter's Road; E. A. Martin, F.G.S., 23, Campbell Road; Alfred Roods, 67, Thornhill Road; A. Tarver, 7, Stuart Road, Thornton Heath.

The President's Address.

Ladies and Gentlemen,

In coming before you to-night with the usual Presidential Address, I feel that I owe an apology to you all for my many shortcomings. When Mr. Moore communicated to me your wish that I should allow myself to be put in nomination for the office of President, I felt that the pressure of other work would be very heavy, and that I should be unable to devote as much time as I should have wished to the business of the Society. I feel that I should have utterly failed in my duties but for Mr. Moore, and also the Council, to whom I desire to tender my most grateful thanks.

I propose, in my Address to you to-night, to give a short *résumé* of the work of the Society during the past year; and then, with your permission, to give you some short account of my own special subject, *viz.* the weather of the district during the past remarkably wet year; and also, with your permission, to include with this account some correspondence which I have had with the Astronomer Royal and the London County Council, which will give some idea of the great esteem in which our Society is held. This short account need not interfere with the Meteorological Committee's Report, which will in due course be sent in as usual, as soon as the returns are complete, but it will probably render the reading of it unnecessary.

During the past year we have to regret the loss of two members by death,—one, Mr. John Berney; and the other, Mr. E. L. Shore. Mr. Berney was one of our original members, of whom eight now remain.

Our roll now numbers 201 members—189 adults, 12 juniors. Since last year 14 have resigned, 1 struck off, and 14 new members have been elected, *viz.* 12 adult and 2 junior.

At the Monthly Meetings the following papers have been read:—

April 21st, on "Comets," by Mr. L. N. G. Filon, M.D., D.Sc.

May 1st, "A Section of Clay with Flints, near Woldingham"; "The Plateau Gravel, Upper Norwood Hill;" both by Mr. N. F. Robarts. The latter was supplemented by some notes by Mr. A. J. Hogg, which will appear in the 'Transactions'; also a short paper by Mr. H. D. Gower, on "Flints found at Waddon Marsh."

On Sept. 15th the evening was, as usual, devoted to an exhibition of specimens collected during the holidays.

On October 20th Dr. T. A. Dukes, B.Sc., gave a paper on "The Parallel Roads of Glenroy."

On December 15th Mr. H. C. Collyer, a paper on "Jade."

On November 18th a *Soirée* was held at the Public Hall, which resulted successfully as far as exhibits were concerned. About 276 members and friends were present, but it is to be regretted that so few of the general public as compared with former occasions came, in spite of advertisements three consecutive weeks in three papers, and the issue of a large number of posters and bills.

Sections.

The Anthropological and Archæological Section has had eight meetings,—on almost every occasion having an interesting subject announced for discussion. Several excursions, especially archæological, have been made. The attendance is not mentioned, but I believe it has been fair, though, in consequence of the meeting falling early in the month, and on one or two occasions the circular having been unavoidably delayed, the members only received it the same day as the meeting.

Botanical.—This section has held one evening meeting jointly with the Microscopical Section, but one otherwise on April 23rd. They have, however, held four or five evening rambles in the neighbourhood, besides taking part in general excursions, at which the members have been active, and the annual fungus hunt in September.

Geological.—This section has also been active; at their own meetings a good attendance of members has been obtained. Six meetings have been held, and one joint meeting with the Microscopical Section. Several special excursions have been made, of which reports have been sent in.

Microscopical.—Two meetings have been held by this section, in addition to the joint meetings with the Botanical and Geological Sections.

Museum.—One meeting has been held, but Mr. Robarts reports the addition of several objects to the museum-case at the Town Hall by members and friends.

Photographic.—About twenty-seven meetings have been held, and several separate excursions made.

Zoological.—Seven meetings have been held, and one or two special excursions made. Several members of the section have done excellent work for the Society, but the Hon. Secretary complains that the meetings have not been good; and in reference to this it is desirable to call members' earnest attention to the

trouble taken to arrange meetings; yet on several occasions no one has appeared. This applies not only to the Zoological Section. It is disheartening to those who do work, and will prevent them taking any trouble in future.

Two special zoological excursions were made—one on July 4th, jointly with the London branch of the British Conchological Society, whose president, the Rev. Canon Horsley, attended. A report appears of this.

Excursions.

In addition to the excursions especially connected with one or other of the sections, the following whole-day excursions were made:—

June 1st.—To Leatherhead, Stoke D'Abernon and Cobham, which was very well attended, and has yielded results from the points of view of the botanist, antiquarian, zoologist, and photographer.

August 3rd.—Whole day to Ightham and Sevenoaks. As this occurred while many members were away at the commencement of the holiday season, it was not so well attended as that to Leatherhead, but the attendance was decidedly good. About a dozen members went, and all were much interested in the specimens of eolithic implements displayed and described by Mr. Benjamin Harrison, of Ightham, who afterwards accompanied the members to the Rock Shelters and the Roman Camp, describing the positions relative to other places of archæological interest in the district. The day was thoroughly enjoyable, and of much interest in many ways. A full report appears at p. xv.

The balance-sheet which our Treasurer has put before us is, it seems to me, a satisfactory one. There is a small balance on the debit side. This balance, as you have heard, would have been a credit one but for the cost of the 'Transactions.' I do not, and I believe that you also will not, regret this, for a more beautiful Annual Report I no not think that I have ever seen. It is a credit to all concerned—the council, authors, photographers, and editorial committee.

Weather of 1903.

In dealing with the weather of the past year, I should like to preface my remarks that though it has been an extremely wet one, yet it has by no means been so cold or so sunless as may be imagined. To illustrate this fact I have taken my own observations at Wallington, which have now been taken for very nearly twenty years. I propose to give two short tables: (1), the mean temperature of 1903 as compared with the average of the fifteen years, 1886–1900; and (2) the duration of sunlight in 1903 as compared with the same average.

MEAN TEMPERATURE.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average 1891–1900	deg. 37·8	deg. 38·4	deg. 41·8	deg. 47·3	deg. 53·3	deg. 59·8	deg. 62·5	deg. 61·9	deg. 57·8	deg. 49·5	deg. 44·5	deg. 39·0	deg. 49·5
1903	40·8	44·7	46·3	44·0	53·6	55·7	61·1	59·6	57·6	52·8	44·3	38·5	49·9

SUNLIGHT.

	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average 1886–1900.	hrs. 42·2	hrs. 62·1	hrs. 115·0	hrs. 159·9	hrs. 200·6	hrs. 206·0	hrs. 210·1	hrs. 198·3	hrs. 160·2	hrs. 100·4	hrs. 51·3	hrs. 38·9	hrs. 1545·6
1903.	54·3	92·1	165·2	153·2	189·5	174·1	194·1	201·8	183·3	97·5	42·2	28·3	1575·6

These tables well deserve careful study, and they show (1) that the months of January, February, March, and October were exceedingly warm, the excess of temperature being respectively 3°·0, 6°·3, 4°·5, and 3°·3; (2) that the months of April, June, July, and August were cold, the deficiency being respectively 3°·3, 4°·1, 1°·4, and 2°·3; (3) the other four months differed but slightly from the average; and (4) that the year was slightly above the average by 0°·4. With respect to the sunlight table we have a somewhat different distribution, *viz.* (1) the months of January, February, March, and September were sunny, the excess in hours being respectively 12·1, 30·0, 50·2, and 23·1; (2) that the deficiency in hours in April, May, June, July, November, and December was somewhat large, namely, respectively in hours, 6·7, 11·1, 31·9, 16·0, 9·1 and 10·6; (3) that the remaining two months differed but slightly from the average; and (4) and that the year was above the average by 30·6 hours, practically three days. It will be noticed from these tables how closely the mean temperature and sunlight correspond, but the tables do not show the disastrous consequences of the, shall I say it, celebrated frost in April, which practically destroyed all our fruiting season.

I will now deal shortly with the rainfall of the district. In the 'Times' of Monday, Jan. 11th, 1904, there appears a letter from Dr. Mill, who has most courageously put on the mantle of our late honorary member Mr. G. J. Symons, giving a short account of the rainfall of 1903, in which he practically sums up the results of 1903 as follows: "that in England, 1872 must be taken as the first and worst, 1852 second, and 1903 third." This

applies to the kingdom as a whole, but it would seem from this letter that this does not apply to London. Of course Dr. Mill had not access to the complete records of your Meteorological Committee, as the December sheet is not yet in the printer's hands. As you know, your organization takes in the whole of South London, also a large part of the surrounding country south of the Thames, and from these records we have for 1903 the greatest amount, 50·04 in., at Denbies, Dorking, where the mouth of the gauge is 6 in. above the ground, and the height of the station 610 ft. above O.D., and the least amount 26·13 in. at the Town Hall, Anerley, where the gauge is 40 ft. above the ground on the roof of the building, and the height of the station 191 ft. above O.D., which would appear from the experiments of Prof. Phillips, F.R.S. (see 'British Rainfall,' 1880, p. 19) to be equivalent to 32·66 in. at ground level, an amount which would leave Battersea as the lowest, with a record of 30·65 in. In his letter Dr. Mill estimates the rainfall for the whole of London as about 37 in., which is the average volume of rain and half as much again. With the view of seeing what was the excess of the fall of 1903 over the 10 years' average, 1891–1900, which, by-the-by, was a dry period, I have compared them, and find that the greatest excess occurred at Leatherhead, which had 45·97 in., an excess of 20·74 in. above the average; and that the least was at New Malden, which had 30·87 in., an excess of 9·82 in. One of the great features of the rainfall was the very large number of days on which the fall was over one inch, there being at Dorking alone nine of such falls.

With reference to the total rainfall for 1903, it seems probable, if we may take the observations at Greenwich for a guide, that there has been no such fall for probably over one hundred years. The total fall of rain at Greenwich for 1903 is 35·54 in., and with reference to this I should now like to include a copy of a letter which I wrote to the Astronomer Royal on Dec. 9th, 1903, and the answer of Mr. Nash written by his order.

Cotswold, Wallington, Surrey,
9th Dec., 1903.

My Dear Sir,

You have for many years past very kindly sent me the rainfall returns of the Observatory for publication in the "Daily Rainfall" sheet of the Croydon Natural History Society. Having regard to this extraordinary wet year of 1903, I am emboldened to make a request, which I trust that you may see your way to grant. The present year's rainfall for the eleven months totals up to 34·27 in., which exceeds the year's total of 1852, which is 34·01 in., this year being previously the highest since 1841. In the Proceedings of the Meteorological Society, vol. 5, p. 87, there is a paper giving the daily rainfall from 1815 to

1869, by the late Mr. Glaisher, in which, from 1815 to 1840, both exclusive, the only years having a total fall of 30 in. and above are :—

1821	.....	31·53 in.
1824	.....	32·98 in.
1830	.....	31·14 in.
1831	.....	34·48 in.
1836	.....	31·01 in.

In this paper, on p. 112, Mr. Glaisher says :—"The series is mainly that of the Royal Observatory, Greenwich, which began on January 1st, 1815, my investigations closing with the end of the year 1869. During this period the fall of rain has been registered at Greenwich daily from the year 1815 to 1830, and from 1836 to the present time; from 1830 to the end of 1835 the falls were not registered daily, but only at two or three or more days' interval; and for the daily falls in this period I have had recourse to a journal in my possession, taken apparently with great care, at High Wycombe, near Reading." On the top of p. 114 he gives a description of the gauge and the corrections he applied.

What I am going to ask is that you will kindly direct an inquiry to be made as to the rainfall of 1831 at the Observatory, as that year seems to be the nearest to the present one, and let me know the result.

I hardly like to ask for the other four years mentioned, as I particularly do not wish to trouble you more than I can possibly help.

I am, my dear Sir,
Yours very truly,

(Signed) F. Campbell-Bayard.

The Astronomer Royal.

Royal Observatory, Greenwich, London, S.E.,
December 10th, 1903.

Dear Mr. Bayard,

I am desired by the Astronomer Royal to furnish you with particulars relating to the rainfalls recorded at the Observatory in the years mentioned in your letter of Dec. 9th. The observations were made at very irregular intervals, sometimes after the lapse of three or four days (as has already been pointed out in Mr. Glaisher's paper), and cannot be considered to be of equal value to those made after the establishment of the regular meteorological service in 1841. This being premised, I will proceed to give details of the amounts. The amounts for the years 1821 and 1824 are correctly given in Glaisher's paper, *viz.* 31·53 in. and 32·98 in., but the other values are not derived from the Observatory journals. In 1830 and 1831 the results from observations of a gauge placed on the ground are 24·62 in. and 26·41 in. respectively; and in 1836 the amount recorded at 22 ft. above the ground was 24·50 in., which is equivalent to an amount for ground-level of 27·84 in., using the proportion established by a comparison of the results given by the gauges on the ground and at the height of 22 ft. made in the years 1841–1850.

By permission of the Astronomer Royal I am now engaged in dis-

cussing the results for these earlier years, with a view of forming a complete table for the period 1815–1903, for presentation to the Royal Meteorological Society.

I am, dear Mr. Bayard,
Yours faithfully,

W. C. Nash,
For the Astronomer Royal.

F. Campbell-Bayard, Esq.

This answer from the Astronomer Royal is, I feel sure that you will agree with me, the more gratifying because it is unexpected. It is an instance of the esteem in which our Society is held, that the oldest observatory in the kingdom should be willing to undertake a long and laborious work of examining, tabulating, and discussing the rainfall returns from 1815 to 1840 under, as you see from the letters, circumstances of peculiar difficulty. There is luckily a journal by Mr. Belville, who was during these earlier years an assistant at the Observatory, extant, and this has been lent by the Royal Meteorological Society to the Astronomer Royal for the purpose of affording any help that it is capable of rendering to the investigation.

The only other piece of information that I have to give is a letter from the Clerk of the London County Council in answer to one of my own. I do not think that it is necessary to include a copy of my own letter, for Mr. Gomme's letter sufficiently explains itself:—

County Hall, Spring Gardens, S.W.,
23rd December, 1903.

Sir,

With reference to your letter of 27th ultimo, addressed to the Chief Officer of the Council's Parks Department, asking that the Croydon Natural History and Scientific Society may be supplied with the rainfall returns from the Council's parks south of the Thames, for the purpose of including them in the monthly return issued by the Society, I have the pleasure to inform you that instructions have been given for the returns from Battersea, Brockwell, and Southwark Parks, and Telegraph Hill to be forwarded to you monthly. The parks mentioned are the only parks south of the Thames where records of rainfall are kept.

The Council will be pleased to receive the monthly return issued by the Society, which you have kindly expressed your willingness to supply.

I am, Sir, your obedient Servant,

G. L. Gomme,
Clerk of the Council.

F. Campbell-Bayard, Esq., F.R.Met.Soc.,
Cotswold, Wallington, Surrey.

This letter, as you will agree with me, is as cordial as it is gratifying. It is but one of many instances which go to show

that our great municipal bodies are appreciating the aid which even a comparatively small Society like our own may give in helping forward the study of the problems which affect the health of our great cities and towns.

In closing my address to you to-night, may I tender to you my thanks for listening to me so long and so patiently, and may I express a hope that our Society may prosper during this present year, and prove of some, even though it is but small, use to this town which has given it birth, and to the county at large.

British Association.

Report of the Meeting of Representatives of Corresponding Societies at the Meeting at Southport, Sept. 1903.

The Committee of the Corresponding Societies, consisting of Messrs. W. Whitaker and F. W. Rudler, Sir John Evans, and others, report that they recommend that the work entrusted to the Sectional Committees, under Rule 10 of the last Report, shall henceforth devolve upon the Organizing Committees. The effect of which will be that the Organizing Committees of each Section will transmit to the Secretaries of Sections, and through them to the Secretaries of the Conference of Delegates, any recommendations that the Corresponding Societies desire. The Organizing Committees to specify what local work can be most usefully undertaken by the separate Corresponding Societies. This work the Council of the Association will consider, particularly to develop science and scientific education throughout the provincial centres. These subjects will be discussed after consideration by the Committee of the Council at the following meeting of delegates, of which a letter has been addressed to the leading officers of the Corresponding Societies.

The Committee of the Council of the British Association express the opinion that immense benefit would accrue to the country if the Corresponding Societies would take advantage of the expert knowledge many members possess to endeavour to secure representation for scientific education on the Educational Committees now being appointed under the new Act. The Council invite the opinion of the Corresponding Societies upon higher education to be put forward by their representatives at the next meeting of delegates for full consideration of this subject. In the President's Address the want of scientific education in this country was deeply deplored, and its great loss shown both in the dignity of, and profit to, the nation.

Beyond the subject of higher education, which occupied much of the time, the general useful work of the Corresponding Societies was recommended by the various speakers for research in anthropology, zoology, botany, geology, meteorology, and photography. Upon the work done some reports were given verbally. The prevailing idea for the future being that these subjects should be studied in detail, that useful if not original work might be produced. It was particularly urged that a good account of the flora of each district should be carefully recorded, as it was found that all evidences of ancient vegetation commonly disappeared before modern buildings near towns. The de-

sirability of preserving antiquities—prehistoric and later—was pointed out by the endeavour of Corresponding Societies to support and found museums.

I do not feel it necessary to discuss these subjects in detail, as it does not strike me that any new ideas were introduced upon them. The following interesting communications were made, which will be printed:—

(1) "The Methods and Results of a Botanical Survey of Counties," by W. G. Smith, Ph.D., B.Sc., and W. M. Rankin, B.Sc.

(2) "A Suggestion with respect to Exploration and Registration work for County Local Societies," by W. Cole, F.L.S.—Wm. F. Stanley.

Obituary Notice.

The late Mr. John Berney.

During the past year the Society has had to regret the loss of one of its prominent and oldest members in the death, on September 9th, in his eighty-second year, of Mr. John Berney, who had been a member from the formation of the original Croydon Microscopical Club in 1870, and was President during the years 1883 and 1884. Mr. Berney's chief interest was in entomology, and his collection of insects found in the locality contained many fine series and several varieties arranged with great care. He had also collected in the New Forest. He also took much interest in microscopy, and gave a paper on Mounting Objects for the Microscope at one of the Conversational Meetings. Mr. Berney will be specially remembered for his exceedingly kind and genial manner, and for his readiness on all occasions to assist others, especially younger members; also for the trouble which he took for many years in the arrangements for the Annual Soirées, his practical knowledge of such matters contributing very largely to the success of these meetings. Mr. Berney was a member of the Royal and Quekett Microscopical Societies.

Summary of Proceedings.

Excursions.

April 18*th* (Saturday).—Kew Gardens. Conductor, Mr. H. T. Mennell.

April 25*th* (Saturday) and *May* 9*th* (Saturday).—Joint excursions with Geologists' Association to Loam-pit Hill, Lewisham, and to Crayford and Erith. (See report of Geological Section, p. xxiii).

May 21*st* (Thursday).—Botanical Section, evening excursion (see p. xix).

May 23*rd* (Saturday).—Photographic Section.

May 30*th* (Saturday).—Photographic Section.

June 1*st* (Whit-Monday).—Whole day. Leatherhead, Stoke D'Abernon, and Cobham.

A whole-day excursion was made under the guidance of Dr. Parsons and Mr. G. W. Moore to the valley of the Mole below Leatherhead. The day was very fine and hot, and there was a good attendance of members. Shortly after leaving Leatherhead station, the route taken was by Fetcham mill-pond; this is an artificial sheet of water of considerable size, formed by holding up with a bank the large springs which issue here from the chalk where it dips beneath the tertiary clays. One large spring of beautifully clear blue water was seen issuing from a deep depression in the bottom of the pond. From Fetcham a footpath, found with some difficulty, led across meadows, and through a field of tall rye and scarlet clover to Slyfield House. This is an old house with a history, and possesses some interesting architectural features in brickwork; but the party were not able to obtain permission to visit it. Crossing the Mole, Stoke D'Abernon was reached, and a visit was paid to the church, which is picturesquely situated on the river-bank in the grounds of the Manor House. It is an unpretentious building externally, but contains a large number of well-preserved monuments of the D'Abernon, Vincent, and Phillips families, from ancient brasses and stone effigies of James the first's time to modern mosaics and inlaid marbles. There are also ancient armour, a parish chest with three locks, said to be six hundred years old, and on the pulpit an iron stand for the hour-glass by which the preacher timed his sermon. One small window consisting of a single light in the west end of the church, also the font, are said to be eight hundred years old. The church is mentioned in Rickman's 'Gothic Architecture' as one of twenty churches in the country containing old "long and short" work in east wall and chancel arch, in Rickman's opinion dating back before A.D. 1000, but the work itself is not now visible. After a halt for lunch the party walked on to Church Cobham, a village picturesquely situated on the river Mole, with an old mill and a brick bridge of many arches. The church here possesses fewer special features than that at Stoke D'Abernon, the chief being the Norman south doorway and wooden porch. It had been proposed to visit the Hut Ponds on Ockham Common, but time did not permit of this, except in the case of one energetic visitor, and the rest of the party walked through pleasant wooded lanes to Effingham Junction, and spent the time while waiting for the train on the adjoining common. The return was made to Leatherhead, and, after tea there, to Croydon.

As regards botany, the route lying almost entirely over London Clay, the flora was not expected to present any very special features, though wet-loving plants were better represented than

they are in the comparatively waterless region south of Croydon. The aquatic and waterside plants, however, were not many of them yet in flower, and the swollen state of the river and ponds, owing to the heavy thunderstorm on May 30th, prevented their being easily reached. *Hippuris vulgaris* (marestail) was plentiful in Fetcham Pond. *Geranium pyrenaicum* and *Rhinanthus crista-galli* (yellow rattle) were found at Fetcham; and *Cerastium aquaticum* by the river at Slyfield. *Œnanthe crocata* and *Nasturtium amphibium* grew by the Mole at Cobham; and *Viola canina*, *Genista anglica*, *Lathyrus macrorhizus*, *Pedicularis sylvatica* (a nearly white-flowered variety), and *Carex pilulifera* on Effingham Common. A few species of fungi, as *Agaricus semiglobatus*, *Marasmius oreades*, *Boletus flavus*, and *Æcidium urticæ*, were seen.

The results of the day as regards entomology and conchology are thus given by Mr. Gower:—

The walk by Fetcham Ponds yielded many varieties of the little reed beetles, *Donacia sagittariæ;* the common caddis-fly, *Sialis lutaria*, was also very abundant on the wing here; several species of *Ephemera* also being noticed. From the pond itself one member took the freshwater snail, *Physa fontinalis;* while upon the reeds by the bank *Succinea putris* was very abundant, but somewhat small in size, and not fully developed. *Helix hortensis* (var. *lutea*) was found on the other side of the path; also *Hyalinia nitidula* and *Helix hispida* (= *H. concinna*). Walking from here towards Stoke D'Abernon, some of the party who got slightly astray from the main party took a lane leading from Eastwick Park, and coming out to the road skirting a part of Great Bookham Common. On the way the beetle *Telephorus lividus* was taken; the snail *Helix cantiana* was abundant, but not full-grown. In the lane skirting the park, many of the beautiful dragonfly, *Colopteryx virgo* (female and male), were captured; the well-known spring butterfly *E. cardamines* being frequently met with and captured. Some little ponds by the side of the common yielded another little dragonfly, *Agrion puella* (males only). The Mole at Cobham being reached, *Ephemera vulgata* was very abundant. The freshwater mussel, *Unio pictorum*, was found in the Mole, but empty shells only; and also the freshwater limpet, *Ancylus fluviatilis*. On the way to Effingham Junction, a wayside pond at Downside yielded *Limnæa peregra*, *Planorbis corneus*, *P. albus*, *P. vortex*, and *P. complanatus*.*

June 13*th* (Saturday).—Beddington and Carshalton.

June 18*th* (Thursday).—Botanical Section, evening excursion (see p. xix).

* This name has been altered during the last few years, since 1892, to *P. umbilicatus*.

July 4th (Saturday).—Merstham and Caterham, in conjunction with the Conchological Society of Great Britain and Ireland. Conductor, Mr. H. D. Gower.

Nine members were present at this excursion, *viz.* five from our own Club, including two ladies, and four of the Conchological Society, the President of the London branch of the above Society, Canon Horsley, being amongst those present.

A most enjoyable but somewhat dusty walk was made. Starting from Merstham Station, the road taken was a little north of the station and south of the spot where the old mill once stood. From here to Rockshaw little was found in the way of mollusca, some *Helix cellaria* and an isolated specimen of *H. hortensis* var. *lutea* being found. *H. caperata* and also *H. virgata* were noticed, but very small and immature, by the footpath leading up the hill by Rockshaw. *H. cellaria* was found under some pieces of limestone, as well as a specimen of *Cochlicopa lubrica*.

Insect life was exceptionally scarce; a specimen of the moth *Xylophasia lithoxylea* was boxed on a post, and curious to note was the absence of butterflies. Taking the footpath to the top of the hill by the Quarry Hangers, a search was made for *Helix pomatia*, and living specimens of this well-known shell were curiously absent, although plenty of empty shells and also operculum were in evidence. *Cyclostoma elegans* was also taken in the long grass beside the path by the hill. Numbers of cocoons of the burnet moth, *Zygæna filipendulæ*, on the grass-stems were noticed. The road to Caterham was then taken, a compressed variety of *Helix rufescens* being found; the members taking tea together at the 'Railway Hotel,' Caterham Valley.

The flora noted in the walk were as follows, and only include the less common and more conspicuous plants. List furnished by Mr. Cooper, Conchological Society, London Branch:—

Agrimonia eupatoria, *Anthyllis vulneraria*, *Briza media*, *Bromus erectus*, *Bryonia dioica*, *Calamintha acinos*, *Carduus acanthoides*, *Chelidonium majus*, *Chlora perfoliata*, *Conium maculatum*, *Cornus sanguinea*, *Daucus Carota*, *Fragaria vesca*, *Fumaria officinalis*, *Helianthemum vulgare*, *Hieracium pilosella*, *Hippocrepis comosa*, *Hordeum pratense*, *Ophrys apifera*, *Orchis maculata*, *Plantago media*, *Polygala vulgaris*, *Poterium Sanguisorba*, *Rosa arvensis*, *Salvia verbenaca*, *Stellaria graminea*, *Thymus Serpyllum*, *Trifolium incarnatum* (white), *T. hybridum*, *Verbascum Thapsus*, *Vicia Cracca*.

July 11th (Saturday).—Photographic.

July 16th (Thursday).—Botanical, evening excursion (see p. xix).

July 18th (Saturday).—Box Hill, Denbies Park, and Ranmore. Conductor, Mr. J. H. Baldock.

July 25th (Saturday).—Three Bridges for Worth (see p. xviii).

August 3rd (Monday).—Bank Holiday. Whole day. Ightham, Oldbury, and Knole Park. Conductor, the President.

In spite of the threatening appearance of the weather, this excursion was favoured by a most enjoyable day, bright and pleasant. About twelve members attended; the main body of the party meeting at Beckenham Junction, whence they travelled to Wrotham by the 11.40 train, arriving soon after 12.30. Some members who had started earlier or cycled were met at Ightham, where, after noticing a very fine example of old domestic architecture in a timbered house at the end of the village, lunch was had at 'The Chequers.' This had been very kindly arranged by Mr. B. Harrison, who afterwards took the party to his house to view his collection of flint implements, giving a very elaborate description. Mr. Harrison has been engaged on the study of the flint implements found by him in the neighbourhood for over thirty-five years. He divided the implements into five classes: those from the plateaus, termed eoliths; those of the hill-men deposited in drifts; those of the valley-men deposited by rivers—these two series comprising the older palæolithic implements—the newer palæoliths from rock-shelters, and the neoliths found spread over the country. The earliest forms have been much debated upon, but are now recognized by many as being actually worked. Mr. Harrison then conducted the party to the rock-shelters at Oldbury, and from the high ground pointed out the places in the neighbourhood whence he had obtained the various classes of implements. The rock-shelters are just to the north of the Roman Camp, and are formed by a hard rock in the Folkestone beds of the Lower Greensand, over which formation the whole of the route taken lay. The party then went to some rising ground with mounds, believed by many to be artificial, and to present a sinuosity indicating a possibility of connection with serpent-worship. Due east from this spot, the site of Kits Cotty House could be seen. The Roman Camp was then visited, the fosse surrounding it pointed out, and the whole position explained by Mr. Harrison, to whom a hearty vote of thanks for his kindness and attention was moved by the President. The party then proceeded by Seal Chart and Godden Green to Knowle Park, noticing in the park the fine old trees known as the king's beech and King John's oak; but time did not allow of much stopping, and, after having tea at Sevenoaks, the party returned to Beckenham Junction from the Bat-and-Ball Station.

September 12th (Saturday).—Fungus foray, Addington Park.

Favoured by fine weather, the annual exploration for fungi was very successful, except that our leader, Dr. Parsons, was unavoidably absent. This was the more unfortunate, as the present

wet season has greatly favoured this section of plant-life, thus standing in strong contrast with recent dry autumns. There was a good muster of members and their friends, eighteen in all, taking the walk through the beautiful woods which form the upper part of Addington Park, permission to visit the park having been kindly given by the present proprietor, F. A. English, Esq. Starting from the lodge entrance on Shirley Church Road, we first worked eastwards to the obelisk, by the Cedar of Lebanon planted in commemoration of the Jubilee of George III. Thence we traversed the undulating ground towards the western entrance on the Shirley Hills. The woods are mainly of birch, with areas of Scotch firs and other conifers, fine beeches, mountain ash, sweet chestnut, and oak. The last was not largely represented. Everywhere was a thick undergrowth of bracken. The party was fortunate in obtaining thirty-nine species in all, the names of which are appended, as identified by Dr. Parsons, to whom they were submitted. The four which are starred are less common species and new additions to the local series. On the pasture land above the house very few were found of any kinds, it being hardly late enough in the season for the majority of the pasture-frequenting species, and not a single mushroom was seen. But the woodlands made full compensation, giving an abundance of specimens, as well as species such as one seldom sees. In one part the ground beneath the bracken was thick with the handsome yellow edible chanterelle, many specimens being of unusual proportions. This latter point was true also of several other species, as *Boletus edulis* and *Polyporus betulinus*, the latter of which was plentiful on birch trees.

Fungi found at Addington Park, September 12th, 1903:—

Agaricus (*Amanita*) *rubescens*, *A.* (*Amanita*) *phalloides*, *A.* (*Amanita*) *vaginatus*, **A.* (*Amanita*) *pantherinus*, *A.* (*Tricholoma*) *terreus*, *A.* (*Clitocybe*) *laccatus*, **A.* (*Collybia*) *maculatus*, *A.* (*Mycena*) *galericulatus*, *A.* (*Stropharia*) *æruginosus*, *A.* (*Hypholoma*) *fasciculares*, *A.* (*Psilocybe*) *semilanceatus*, *A.* (*Psilocybe*) *spadiceus*, *Cortinarius elatior*, *Hygrophorus psittacinus*, *Cantharellus cibarius*, *Lactarius turpis*, *L. subdulcis*, *L. pyrogalus*, *L. rufus*, *L. vellereus*, *Russula emetica*, *R. virescens*, *Marasmius peronatus*, **Lentinus cochleatus*, *Boletus edulis*, *B. flavus*, **B. felleus*, *Polyporus betulinus*, *P. annosus*, *P. versicolor*, *P. vaporarius*, *Thelephora laciniata*, *Stereum hirsutum*, *Corticium læve*, *Clavaria inæqualis*, *Calocera viscosa*, *Phallus impudicus*, *Scleroderma vulgare*, *Lycoperdon pusillum*.

Evening Meetings.

March 17*th*.—Reading of Meteorological and Botanical Committees' Reports.

April 21*st*.—Mr. L. N. G. Filon, M.A,, D.Sc., on "Comets." (See Trans., Art. 1.)

May 19*th*.—Mr. N. F. Robarts, F.G.S., "On a Section of Clay with Flints near Woldingham" (see Trans., Art. 2), and "On the Plateau Gravel, Upper Norwood" (see Trans., Art. 3). Note on same, by Mr. A. J. Hogg (see Trans., Art. 4). Mr. H. D. Gower, "Flints found at Waddon Marsh," illustrated (see Trans., Art. 5).

Sept. 15*th*.—Notes by members on results obtained during the vacation.

Oct. 20*th*.—Dr. T. A. Dukes, B.Sc., "On the Parallel Roads of Glenroy." (See Trans., Art. 6.)

Dec. 15*th*.—Mr. H. C. Collyer, on "Jade" (Nephrite). (See Trans., Art. 7.)

Soirée.

A Soirée was held at the Public Hall, Croydon, on Wednesday, November 18th, and notwithstanding that less time than usual had been available for arrangements, was very successful. A considerable number of interesting exhibits were shown by the following members and friends:—

Messrs. W. Watson & Sons, of Holborn: Radium.
Messrs. W. F. Stanley & Co., London Bridge: X-Ray apparatus.
Mr. J. H. Baldock, F.C.S.: Photo-micrographic apparatus.
Mr. H. C. Collyer: North Europe hand-mangles, shell money from New Britain, native decorative work, and Chinese coins.
Mr. E. Lovett: Specimens illustrating the origin and evolution of the pen-annular brooch.
Dr. J. M. Hobson: Photographs of the same subject.
Mr. E. A. Martin, F.G.S.: Geological implements and minerals.
Mr. J. Epps, F.L.S.: Jade specimens from China and Siberia.
Mr. J. O. Pelton: Japanese lacquer ware.
Miss A. E. Willson: Antique and modern shoes and antique bodices.
Dr. H. F. Parsons: Two hundred and twenty species and varieties of flowers gathered in bloom same day, including strawberry in fruit.
Mr. J. H. Baldock: Fir-cones (showing formation).
Miss Klaassen: Leaf of *Bryophyllum calicinum*, see description.
Mr. C. E. Salmon: Dried plants.
Mr. W. M. Holmes: Boomerangs, skin of Australian monitor.
Miss Hobson: Fungi.
Mr. J. H. Goodman: British beetles.
Mr. Elliott: Palæolithic implements.
Mr. N. F. Robarts, F.G.S.: Fossils.
Mr. A. J. Hogg: Red lustrous ware (Roman) and fossils.
Mr. J. H. Carpenter, F.E.S., Leatherhead: Cases of butterflies comprising 1240 specimens.
Mr. S. E. Hall: Young living specimen of boa constrictor, and casts of skins.
Messrs. Negretti and Zambra: Deep-sea thermometors and self-recording anemometors.

Mrs. H. D. Hall: Photographs of Yellowstone Park, California; specimens of North American bead and poker work.

Mr. C. Thorpe: Mounted specimens of British birds, and fish.

Microscopes.—Messrs. J. E. Syms; T. D. Ersser, F.R.M.S.; E. Hinton; W. H. Langton; J. H. Stanley; A. Smith, Q.M.S.; A. Fitzgerald; and Dr. Dukes, B.Sc. Messrs. W. Watson & Sons; Messrs. Beck & Co.

Photographs.—Messrs. J. H. Baldock; H. W. Corry; J. Epps, Jr.; H. D. Gower; W. L. Moore; Dr. J. M. Hobson; and Mr. N. Waterall. Collection of Photographic Survey and Record of Surrey, per Mr. H. D. Gower.

Document.—Mr. J. O. Pelton: Petition for incorporation by the inhabitants of Croydon to King William and Queen Mary, dated Feb. 5th, 1701.

Lantern-slides lent by: Messrs. J. Epps, Jr.; Faunthorpe; E. A. Martin; J. H. Baldock; and Dr. Hobson.

Description of Leaf of Bryophyllum calicinum.—*Bryophyllum calicinum*, order *Crassulaceæ*, is a tropical plant having fleshy leaves with crenate margins. When the leaf is full-grown, there are in each indentation of the crenate margin a group of cells which, to the naked eye, appear as a rounded elevation. This group of cells does not develop further so long as the leaf remains on the stem; but, if removed and laid upon the ground, these groups of cells begin to develop into small plants with stem, leaf, and root. The plants live upon the food-material and water stored in the fleshy leaf until the reserve material is consumed. The rootlets then start off to find nourishment in the ground.

Reports of Sections for 1903.

Anthropological and Archæological Committee.

Eight meetings of the Committee and Section respectively have been held during the year.

Meetings.—The following members have exhibited and described antiquities and other objects during the year:—Messrs. Clinch, Collyer, Hogg, Lovett, and Tarver, and Dr. Hobson.

The following are the subjects which have been discussed, and when possible illustrated by means of specimens:—Roman pottery; Samian pottery; ancient horn and leather work; Easter customs in England; spindle-whorls; brooches and pins; cultivation terraces; prehistoric flint and other stone implements; jade objects from Pekin, New Zealand, and Brittany; bull-roarers and other objects from New Guinea, &c.

Excursions.—Two excursions were projected. The first, on June 13th, to Beddington and Carshalton, was abandoned in consequence of the very heavy rain. The second, on July 25th, to Worth Church, Sussex, was a successful visit, and fairly well attended. The more important architectural features were described by Mr. George Clinch, who drew attention to the interesting combination of British and Roman (Basilican) types in the plan. The thanks of the Committee are due to Mr.

F. Campbell-Bayard (President), who kindly offered tea on the occasion of the Beddington and Carshalton excursion; to the Rectors of Beddington, Carshalton, and Worth, and the Secretary of the Royal Female Orphan Asylum, Beddington, for kindly giving to the Committee permission to visit the buildings under their charge.

Botanical Committee.

During 1903 the Botanical Committee have held sectional meetings, Saturday afternoon and Thursday evening excursions. The investigation of the flora of the commons near Croydon has been continued, and botanical specimens have been exhibited at the Society's meetings and at the Soirée. (See p. xvii.)

On Thursday, March 26th, a joint meeting of the Botanical and Microscopical Sections was held. Microscopic plants were the subject of a talk opened by Dr. Parsons, and illustrated by living and mounted specimens shown under the microscopes.

On Thursday, April 13th, the Society's herbarium was on view. Surrey specimens were exhibited and added to the collection.

Saturday afternoon excursions were made on:—
April 18th to Kew Gardens. (See p. xi.)
September 12th to Addington Park. Fungus Hunt. (See p. xv.)

The excursion on Whit-Monday, June 1st, was also of botanical interest. (See p. xii.)

On May 21st, under the leadership of Dr. Parsons, a visit was paid, by kind permission of C. H. Goschen, Esq., to Thrift Wood, near South Croydon. Thrift Wood is on the chalk, with a loamy or clayey top-soil, as in the lower part of Croham Hurst near by, and the flora is generally similar. The primrose, however, which is now almost if not quite exterminated at Croham Hurst, is still very abundant in Thrift Wood, and the following plants were observed there which have not of late years at least been found at Croham Hurst, viz. *Orchis mascula* and *maculata*, *Habenaria chloroleuca* (butterfly orchis), *Lithospermum officinale* (gromwell), *Cnicus palustris* (marsh thistle), and *Hypericum montanum* (found last year in the old chalk-pit by Croham Lane). The only fungus observed was *Leuzites betulina*, fungi being scarce this spring, in spite of the wetness of the season. The oak was in full leaf, and nightingales were heard in song.

The second ramble, under the guidance of Mr. J. E. Clark, B.A., B.Sc., took place on June 18th to Mr. Cochrane's British Botanic Garden, Perry Hill, S.E. In all, a party of nearly twenty paid a most interesting visit to this spot, actually within one of the London boroughs, where Mr. Cochrane, a working gardener, cultivates some eight hundred British species of flowering plants with signal success. He has managed to afford many of them a natural soil. The hillocks on which were chalk flora and heath flora were good illustrations of this. This garden would at any time be a source of pleasure to those interested in our native flowers. Mr. Cochrane is very glad to supply fresh flowers to schools or others for botanical purposes.

The third ramble was on July 16th to Purley Downs. Mr. J. E. Clark, B.A., B.Sc., conducted. The stormy evening reduced our

party to five, who approached from the Riddlesdown side. In spite of occasional showers and wet feet, the ramble was enjoyable as well as interesting, and resulted in the observation of a number of our rarer flowers. This, indeed, is the nearest spot in Croydon for not a few, including the cowslip, henbane (*Hyoscyamus niger*), and round-headed rampion (*Phyteuma orbiculare*). Most noteworthy perhaps was the size as well as abundance of the dropwort (*Spiræa filipendula*), which literally whitened large areas with panicles as large as those of meadow-sweet (*S. ulmaria*). A specimen of *Orobanche minor* was picked up by a clover field in the hollow between Purley Beeches and Sanderstead Hill. Another was found by Miss Annie Hinde a week or two earlier on the side of the road just above Sanderstead Station. Appended is a list, by Dr. Parsons, of the chief plants:—*Spiræa filipendula* (abundant and very fine), *Rosa rubiginosa*, *Asperula cynanchica*, *Lactuca muralis*, *Tragopogon pratensis*, *Phyteuma orbiculare*, *Primula veris*, *Gentiana Amarella*, *Hyoscyamus niger*, *Verbascum Thapsus*, *Orobanche minor*, *Verbena officinalis*, *Juniperus communis* (abundant), *Bromus erectus*, *Brachypodium pinnatum*.

The following is a brief summary of the remarkable meteorological characters of the year 1903 as affecting vegetation. The year opened with genial though somewhat rainy and occasionally stormy weather, which lasted during the first three months. There was a week of frost in January, but it was of no great severity, 21° F. on the 14th being the lowest temperature reached; and there was a remarkable absence of snow and of cold east wind. The mean monthly temperature at Greenwich was above the average by 2°·2 in January, by 5°·5 in February, and by 4°·3 in March. In consequence of the mildness of the season the early spring flowers appeared much before the usual date. The annexed table, compiled from observations made by Dr. Parsons in his garden at Park Hill Rise, Croydon, shows that of twenty-seven species of early hardy flowering plants the date of flowering in 1903 was in all but two cases earlier than the mean date in the ten years 1893–1902, the average of the whole being eleven days earlier. The oak was seen in leaf on April 5th. In April, however, the weather became cold and wet, with cold winds and frequent night frosts; and with the exception of a week of hot weather at the end of June, it maintained its cold and wet character throughout the remainder of the year. The April frosts and a succession of cold N.E. winds which prevailed during May and the early part of June were very destructive to fruit-blossom, and except the later strawberries the fruit crop was an extremely bad one. Even the wild berries in the hedgerows were very scarce, with the exception of the hips of the dog rose, and of blackberries; the latter, however, did not ripen properly owing to the lack of sun and warmth in the autumn.

The growth of grass in the meadows was very luxuriant, and those who were able to take advantage of the fine weather at the end of June secured a good harvest of hay, but where this was not done the hay lay long on the ground, and was much damaged by rain; indeed, in some places in the hilly parts of the kingdom it rotted on the ground, and was not worth harvesting. The corn crop was damaged by rust and storms, and the harvest was late and poor. The hop crop was also a bad one. The young foliage of rose-trees and other shrubs was much damaged by the frosts and cold winds in April, and the early

bloom of roses was not so good as the later one. A second bloom occurred on some trees; on June 21st a hawthorn tree was seen covered with bloom near Chaldon. The potato disease appeared in August, and did much damage to the crop. A severe gale on September 10th–11th, occurring when the trees were still in foliage, did much damage, overturning some large trees, and breaking large limbs off others. Owing to the absence of frosts until late in the autumn—the first occurring on the night of November 18th–19th—the fields and trees long continued green; and the tender summer flowering plants, as dahlias, begonias, and nasturtiums, remained in bloom in the gardens. At the Society's Annual Soirée on November 18th the exhibit of flowers gathered in the open air in gardens at Addiscombe and Park Hill comprised two hundred and twenty species and varieties, by far the highest record during the past twenty-two years; the next highest number having been one hundred and seventy in the mild autumn of 1897, and the lowest thirty-two in the cold frosty one of 1901. The large number in 1903 is, however, partly due to the Soirée having been held a week earlier than in previous years; had it been deferred until after the frost which occurred the same night, the number of kinds available for exhibition would have been much fewer. The female flowers of the cob-nut (*Corylus avellana*, var.) were well developed at the end of November in Mr. Mennell's garden, Park Hill Rise.

The rainfall of 1903 has been in contrast to that of 1902 in that, while it has been double in amount (37·84 in. as against 18·65 in. at Park Hill Rise), the number of wet days has been fewer (one hundred and ninety-one as against one hundred and ninety-four). 1903 was a year of heavy downpours; 1902 one of frequent drizzles. But in both years the air was generally humid, and this has been favourable to the growth of cryptogamic vegetation. Mosses have grown more luxuriantly on walls, trees, and heathy ground than in the previous series of dry years; and fungi have been more plentiful than for a number of years past. A number of species of fungi not previously observed in the neighbourhood have been found, and several other of the less common species have reappeared which had not been seen for several years. Lists are appended:—

Fungi Newly Found, 1903.

Agaricus (*Armillaria*) *mucidus*.—Godstone.
A. (*Clitocybe*) *inornatus*.—Chelsham.
A. (*Clitocybe*) *nebularis*.—Mitcham Common.
A. (*Mycena*) *purus*.—Purley Downs.
A. (*Entoloma*) *Bloxami*.—Box Hill.
A. (*Flammula*) *flavidus*.—Coombe Lane.
A. (*Nancoria*) *pediades*.—Hayes Common and Farthing Down.
Bolbitius fragilis.—Hayes Common and Beddington.
Cortinarius sanguineus.—Shirley Hills.
Lactarius fuliginosus.—Botley Clump.
Lentinus cochleatus.—Addington Park.
Panus conchatus.—Tadworth.
Boletus felleus.—Shirley Hills.
Polyporus Schweinitzii.—Shirley Hills.
Hydnum gelatinosum.—Shirley Hills.
H. Auriscalpium.—Keston Common.

Clavaria amethystina.—Lunghurst.
C. fusiformis.—Ballards.
Geaster fornicatus.—Keston Common.
Helvella crispa.—Godstone Hill.
Leotia lubrica.—Croham Hurst.

FUNGI REFOUND, 1903.

Agaricus (Tricholoma) sulfureus.—Purley.
A. (Clitocybe) geotrupus.—South Croydon.
A. (Clitocybe) flaccidus.—Croham Hurst.
Hygrophorus hypothejus.—Shirley Hills.
Cantharellus cinereus.—Croham Hurst.
Nyctalis parasitica.—Croham Hurst.
Craterellus coruneopioides.—Croham Hurst.

Not many additions have been made during the year to the list of flowering plants previously recorded as observed on the commons near Croydon, the numbers at present standing as follows:—

Hayes and West Wickham Commons	333
Keston Common	273
Shirley Hills	174
Croham Hurst	253
Mitcham Common	461
Riddlesdown	167
Worms Heath	50
Farthing Down	62

In this connection it may be mentioned that during the past year the Corporation of Croydon have acquired for the use of the public an additional area of 30$\frac{3}{4}$ acres at Shirley Hills, adjoining Oaks Road. On this additional area grow a number of interesting plants, as *Cerastium quaternellum* and *pumilum*, *Hypericum elodes*, *Trifolium subterraneum*, *Potentilla argentea*, and *Drosera rotundifolia*, which may now be reckoned among the flora of Shirley Hills.

Apart from the systematic record of the flora of the commons, and from the species already mentioned as having been observed during the Society's excursions, the following less frequent species of plants—in this neighbourhood at least—may be put on record as having been observed during 1903, some of them no doubt introductions:—

Thlaspi arvense.—Burgh Heath.
Lepidium Draba.—Gasworks, Waddon.
L. ruderale.—Brickyard, Elmers End.
Saponaria Vaccaria.—Gravel-pit near Hayes station.
Silaus flavescens.—Godstone.
Pimpinella major.—Burgh Heath.
Erigeron acre.—Park Hill.
E. canadense.—Gravel-pit near station, Hayes.
Anthemis tinctoria.—Gravel-pit near station, Hayes.
Filago minima.—Gravel-pit near station, Hayes.
Pulicaria dysenterica.—Mitcham.
Lactuca muralis.—Chaldon.
Jasione montana.—Gravel-pit near station, Hayes.
Atropa Belladonna.—Gravelly Hill near Caterham.

Verbascum Lychnitis.—Selsdon and West Wickham.
Salvia pratensis.—Haling chalk-pit. ? casual.
Spiranthes autumnalis.—Keston.
Scirpus sylvaticus.—Godstone.
Ruscus aculeatus.—Lane between Keston and West Wickham.
Scolopendrium vulgare.—West Wickham.
Lastrea dilatata.—Addington.

And the freshwater algæ :—

Cladophora glomerata.—River Wandle, Beddington.
Batrachospermum moniliforme.—Wallington.

DATES OF FLOWERING OF EARLY SPRING FLOWERS IN GARDEN AT OAKHYRST, PARK HILL RISE, CROYDON.

	Average dates in ten years, 1893–1902.	Date in 1903.	Before Average.
Eranthis hyemalis (winter aconite)	Jan. 17	Jan. 6	11
Galanthus nivalis (snowdrop)	,, 25	,, 25	—
Erica carnea (Mediterranean heath)	,, 26	,, 25	1
Crocus aureus (yellow crocus)	Feb. 11	,, 29	13
Scilla bifolia (early blue squill).....	,, 15	Feb. 8	7
Crocus vernus (purple crocus).....	,, 18	,, 8	10
Dondia Epipactis.....	,, 19	Jan. 25	25
Leucojum vernum (spring snowflake)	,, 20	Feb. 8	12
Crocus Imperati	,, 22	,, 14	8
Helleborus Caucasicus (purple hellebore or lenten rose)	,, 22	Jan. 26	27
Crocus stellaris (cloth-of-gold crocus)	,, 23	Feb. 15	8
Anemone hepatica (hepatica)	,, 23	,, 13	10
Narcissus minimus (least daffodil)...	,, 25	,, 21	4
Saxifraga apiculata (primrose saxifrage)	,, 26	,, 9	17
Iris reticulata (early purple iris) ...	,, 27	,, 18	9
Bulbocodium vernum	Mar. 1	,, 9	20
Scilla sibirica (Siberian blue squill)	,, 2	Mar. 3	—1
Chionodoxa Luciliæ (glory of the snow)	,, 2	Feb. 23	7
Saxifraga oppositifolia (purple saxifrage)	,, 6	,, 23	11
Vinca minor (lesser periwinkle).....	,, 7	Mar. 2	5
Daphne Mezereum (spurge olive red)	,, 9	Feb. 21	16
Amygdalus communis (almond tree)	,, 13	,, 25	16
Forsythia viridissima	,, 15	,, 21	22
Arabis albida (white rock-cress) ...	,, 20	Mar. 8	12
Ribes sanguineum (red-flowered currant)	,, 23	,, 4	19
Erythronium dens-canis (dog-tooth violet)	,, 27	,, 19	8
Iris pumila (dwarf iris)	April 10	April 8	2

Wild Flowers Seen in Christmas Week (at Caterham).—Dandelion (*Taraxacum dens-leonis*), daisy (*Bellis perennis*), gorse (*Ulex europæus*), lesser gorse (*U. nanus*), heartsease (*Viola tricolor*), groundsel (*Senecio vulgaris*), ragwort (*S. Jacobæa*).—J. E. Clark.

Wild Flowers on Christmas Day (at Croydon). H. T. M.—Primroses (very abundant), *Lamium album*, *Pyrethrum inodorum*, *Ranunculus repens*, *Fragaria vesca*, *Mercurialis perennis*, *Leontodon Taraxacum*, *Senecio Jacobæa*, *Veronica agrestis*.

Flowers in Bloom on Christmas Day (at 31, Park Hill Rise). H. T. M.:—Primrose, polyanthus (various), pansy, snapdragon, *Aubrietia deltoides*, wallflower, *Lithospermum prostratum*, *Iberis balearica*, *Alyssum saxatile* (yellow), rose (W. A. Richardson, very good condition), *Vinca minor*, *Helleborus niger* var. *altæfolius*, holy thorn (*Cratægus oxyacantha* var. *Arimatheæ*), cob-nut (female blossom).

Dr. Parsons adds:—*Potentilla alba*, *Calendula officinalis*, *Viburnum tinus*, *Jasminium nudiflorum*, *Escallonia macrantha*, *Petasites fragrans*.

J. E. C.:—Violets, carnation (annual), *P. Auricula*, and *Ceanothus*.

Geological Committee.

The Committee have pleasure in reporting that eight committee meetings, seven sectional meetings, and six excursions have been held during the year, in addition to the Society's geological excursions, April 25th and May 9th, taken in conjunction with the Geologists' Association.

The average attendance at the Committee meetings has been five, and at the sectional meetings ten, against five and twelve respectively the previous year.

No photographs of Geological Sections have been added to the Society's album since the last annual report, but the Committee hope that during the ensuing year members will interest themselves in obtaining photographs of all possible sections.

Very few records of sections have been made this year, but this is partly accounted for by hardly any new sewers or railway cuttings having been made in the neighbourhood of Croydon; this should, however, not have affected photographic records having been obtained from other parts of Surrey.

The excursions during the year were as follows:—

January 10th.—To the Croydon Electricity Works, under the guidance of Mr. Faunthorpe, for the purpose of seeing an exposure of Woolwich and Reading beds in the new reservoir. The pit being full of water, the section was not visible, but the spoil-bank showed fragments of a shell-bed containing Cyrena, underlain by a yellow sand. The party were informed that the section was 6 to 8 ft. made soil, 7 to 9 ft. alluvium, 1 ft. 6 in. shell-bed, 4 to 5 ft. yellow sand.

April 18th.—Under the guidance of Messrs. Whitaker and Robarts, an excursion, to which members of the Geologists' Association were invited, was made to the New Cross cutting of the London, Brighton, and South Coast Railway, by permission of the company's engineer, Mr. Charles L. Morgan. About thirty members of the two societies were present, and were shown the junction of the basement beds of

the London clay with a thin bed of Oldhaven pebbles resting on clayey Woolwich and Reading beds, the upper part of which contained Paludina rock. Specimens of *Unio*, *Cyrena*, *Ostrea*, *Cerithium*, *Hydrobia*, &c., were found. *Pitharella rickmani* was also discovered in this cutting for the first time.

April 25th.—The members of the Society, on Saturday afternoon, joined the Geologists' Association, under the guidance of Mr. W. Whitaker, F.R.S., and Mr. A. E. Salter, F.G.S., in an excursion to Loam-pit Hill, Lewisham. The day being fine, a large party of the two societies assembled. The first pit visited showed the junction of the Woolwich and Reading beds with the Thanet sand, the surface of the latter being considerably eroded, whilst cutting into both was a terrace of Thames gravel, which probably contained flint implements, but there was not sufficient time to search for them. The next pit seen contained the upper beds of the Woolwich and Reading series, including a bed of oyster-shells nearly two feet thick, overlying a bed of Cyrena, in which latter one of the party was so fortunate as to find some turtle-bones. Mr. Whitaker having explained the section, a third pit was visited, where the lower beds of the London clay containing Ditrupa were seen resting upon the Woolwich beds. Several other pits were visited, showing sections of London clay and Woolwich beds, which the Croydon members were able to compare with the same deposits in their own neighbourhood. The party then went to the Horniman Museum, where they partook of tea, and subsequently examined the exhibits.

May 9th.—The members of the Society joined the Geologists' Association in a visit to Crayford and Erith, for the purpose of inspecting the gravels and brickearths of that district. Fortunately the weather was favourable until late in the afternoon, and the party escaped the severe hailstorm which fell in other places. Under the guidance of Messrs. W. Whitaker, F.R.S., and A. E. Salter, F.G.S., the party had a good opportunity of examining the gravel known as the Dartford Heath gravel; also some of the brickearths in pits, which have become historic from the mammalian remains discovered in them, as well as flint implements, which latter have been fully described by Mr. F. J. Spurrell. After partaking of tea at Erith, the party separated, having spent a very interesting afternoon.

June 6th.—An excursion was made to Mr. Brown's clay-pit, Earlswood Common, to see a section in the Atherfield clay, from which the following specimens have been obtained:—Cephalopoda: *Nautilus*, *Belemnites*. Gasteropoda: *Aporrhais Robinaldiana*, *Turritella*. Lamellibranchiata: *Venus vectensis*, *Cyprina angulata*, *Cytherea parva*, *Astarte striato-costata*, *Panopæa plicata*, *Solen*, *Trigonia Etheridgii*, *Mytilus lanceolatus*, *Exogyra sinuata*, *Perna Mullettii*, *Pecten interstriatus*, ? another species, *Anomia lævigata*, *Gervillia anceps*. Brachiopoda: *Terebratula sella*, *Rhynconella*, ? *latissima*. Annelida: *Serpula*. Cœlenterata: *Astrocœnia decaphylla*.

June 23rd.—A visit was paid to the Croydon Gasworks, under the guidance of Mr. H. D. Gower, when Woolwich and Reading fossils were found on the spoil-heaps, viz. *Ostrea tenera* and *bellovacina*, *Cyrena cordata* and *cuneiformis*, *Cerithium funatum*, and *Melania inquinata*.

October 21st.—Under the guidance of Mr. Hogg, twelve members of the Section visited Mr. Iles's gravel-pit at Mitcham, in which remains

of tusks of *Elephas* have been found. The gravel was found to be much eroded in some places, and the axes of the stones composing the gravel were found to be frequently almost vertical. Some worked flints (eolithic) were found by two or three members of the party, and fragments of mammoth tusk were seen.

December 12th.—Mr. Whitaker conducted an excursion to see the flow of the Bourne. The party, numbering twenty-one, walked from Upper Warlingham to Purley. They found the Bourne commenced in the field opposite the 'Rose and Crown' Inn, just above the Gas Company's new gasometer. At the back of the 'Rose and Crown' it was flowing freely, and the party was informed by Mr. Walker, engineer to the East Surrey Waterworks, that the flow had risen to 500,000 gallons per diem. Mr. Walker subsequently showed the party over the Kenley Waterworks, and then took them to the engine-house at Foxley Hatch, where boulders of pudding-stone, taken from the gravel, were pointed out.

The Committee desire to record their thanks to Mr. Charles L. Morgan, engineer to the London, Brighton and South Coast Railway; Mr. Brown, and Mr. Iles, for permission to visit respectively the New Cross cutting, the Atherfield clay-pit, Earlswood Common, and the gravel-pit at Mitcham; and to Mr. Walker, engineer of the East Surrey Waterworks, for showing the members of the Section over the works under his charge at Kenley and Purley.—N. F. Robarts, *Hon. Sec.*

Microscopical Committee.

The Microscopical Section, though it has not yet done great things, has shown some sign of life, and will, in time, it is hoped, quite recover from its long trance, and fully justify its existence.

In March, a joint meeting of the Botanical and Microscopical Sections was held, subject "Microscopic Plants and Fresh-water Algæ," which was well attended, and a great success in every way. Consequently, the next month a joint meeting of the Geological and Microscopical Sections was next held, subject "Geological Microscopy"; this was also a great success. Encouraged by these successes, it was decided, after the long summer holidays, to have a meeting of the Microscopical Section without extraneous aid. This meeting was also most encouraging as regards the members present, and the interest which the paper read by Mr. Lester Reed, one of the members of the Committee, aroused. Its subject was "The Microscope and Food Adulteration." It was fully illustrated by Mr. Reed's own sketches and microscopic slides. The paper has been printed in full, as it was thought a summary would not do it justice.

Museum Committee.

The Museum Committee have pleasure in reporting that the Town Hall Loan Museum still continues to attract interest from the visitors to the Free Library, and it is much to be regretted that more objects cannot be exposed to view, as numbers of persons do not open the drawers to see the contents; and many of those who do are children, who shake them, and in so doing confuse the specimens and disarrange the labels. It is a question whether it would not be better to keep the drawers locked, if arrangements could be made for the key to be obtained if really required.

Upwards of one hundred specimens have been deposited during the year by various lenders, and upwards of fifty have been withdrawn.

Entomological and other zoological loans would be much appreciated, geological specimens so far being much the most numerous.

The Committee consider it would be to the advantage of the Society if arrangements could be made for improving the Museum Collection in the Old School of Art Room. A few donations have been made to this during the year, which the Committee have accepted in the hope that some day arrangements will be made for properly exposing them to view.

The following members of the Society have made loans or gifts of objects during the year:—Messrs. W. B. Bannerman, F.S.A., F.G.S.; F. Churchill; J. E. Clark, B.A., B.Sc., F.G.S.; C. L. Faunthorpe; H. D. Gower; W. G. Hinde; W. Murton Holmes; E. A. Martin, F.G.S.; H. Franklin Parsons, M.D., F.G.S.; G. Phare; N. F. Robarts, F.G.S.; and G. W. Moore and F. E. Walsingham, Junr.; whilst gifts or loans have also been received from Messrs. H. H. Crump, H. Carter, G. F. Brown, E. Hansor, James Healey, Miss M. S. Johnston, and Mr. J. Kidd, who are not members, to all of whom the Committee tender their thanks.

Photographic Committee.

I much regret that I cannot present a more satisfactory report for the past year, and that a considerable falling off in the attendance of members of this Section at the special meetings has to be recorded.

There were in all thirty-two meetings, inclusive of excursions, arranged, of which the following are the chief:—"A Trip to Norway," by C. L. Faunthorpe; "Practical Demonstrations on Elementary Photomicography," by Mr. J. Baldock, F.C.S.; "Night Photography" (illustrated), by Mr. Ellis Kelsen; "Stereoscopic Photography," by Mr. A. Dunning (R.P.S. affiliation); "Birds' Nests and Methods of Photographing them" (illustrated), by Mr. J. C. Crowley; Exhibition of lantern-slides by Messrs. J. and R. Beck; Demonstrations on the uses of Pinakol P. and Pinakol Salt N., by Mr. J. H. Baldock, F.C.S.; "Photographic Lens Making," Messrs. Taylor and Hobson; "Natural History Photography" (R.P.S. affiliation), by Mr. G. T. Harris. The excursions were to Chislehurst and Bickley, on May 23rd; Beddington Church and Orphanage, May 30th; Ranmore Park, Boxhill and Denbies Park on July 18th.

Mr. J. Epps's (Junr.) Competition. A third competition was held, and the following selected by the judges of the Royal Photographic Society—acting for the affiliated societies—for reproduction:—"Ely Cathedral; East Window and Lantern," by Mr. J. H. Baldock, F.C.S.; "Shirley Oaks," by Dr. J. M. Hobson, B.Sc.; "Bruges; Entrance to Beguinage," by Mr. N. F. Robarts, F.G.S. Owing to the small number of pictures originally sent in for competition the time was extended, and a picture by Mr. J. Epps, Junr., "Norman Door, Patricksbourne," was selected for reproduction with the others. The four photographs are reproduced.

Owing to the paucity of attendance, it has been suggested that instead of four meetings each month, one or two will be quite sufficient; but it is much to be regretted that this Section, which used to be one of the strongest, should have fallen off so much. Possibly, however, the unavoidable loss of a very active Secretary, owing to

Mr. Faunthorpe leaving Croydon during the year, has become to a great extent the cause of failure.

The thanks of the Section, and of the Society generally, are due to Mr. Faunthorpe, for all that he did during the time he was a member, and especially whilst acting as Hon. Secretary to the Photographic Section.—J. W. Baldock, *Hon. Sec. pro tem.* (On the retirement of Mr. Faunthorpe, Mr. Baldock very kindly undertook to act as Hon. Secretary, *pro tem.*, and has continued as far as possible to carry on the work of the Section.—G. W. Moore, *Hon. Gen. Secretary.*)

Zoological Committee.

During the past year seven meetings have been held of the above Section, but the series of objects exhibited have been very limited, owing to the small attendance of members.

The principal specimens shown have been land and freshwater mollusca from Surrey localities and elsewhere.

On Jan. 27th Mr. Gower brought a series of *Acidalia remutaria* showing variation of band marking; all the moths were taken at Waddon. The Honorary Secretary showed specimens of foreign land-shells, including a large exotic *Bulimus*.—Mr. Nash, two skulls illustrating the smallest known in animal and bird life.

On Feb. 14th an excursion was made to Beddington for the purpose of collecting freshwater shells, at which seven members attended. A number of specimens were collected from the River Wandle, the best species secured being *Valvata cristata*. At the meeting of Feb. 24th the specimens obtained were exhibited by Messrs. Gower and Nash. Mr. Murton Holmes also showed a number of small pearls from freshwater mollusca.

At the meetings of March 24th and April 28th the Honorary Secretary brought land-shells from Felixstowe, and a series of gulls' eggs showing marked variation; only one member attended.

On Sept. 22nd there were shown a nice series of freshwater shells from Surrey localities by Messrs. Nash and Gower, who also brought an abnormal fungus found growing on deal at the gasworks, Waddon. —Mr. Tarver showed a series of *Pupa umbilicata*, and a scarce shell, *Helix revelata*, from Cornwall, collected during his holidays.

At the meeting of Oct. 27th Mr. Gower explained his method of utilising waste lantern-slide slips for making small glass cases, suitable for holding small natural history objects.

Dr. Parsons, at the November meeting, exhibited live specimens of *Testacella haliotidea*, a slug, somewhat local, found in his garden at Park Hill. In the course of his remarks he mentioned that it was subterranean in habit, was carnivorous, and fed only at night, principally on earthworms, which it kills by severing the worm in half. The rudimentary external shell was very prominent at the extremity of the tail.

Mr. Murton Holmes brought a specimen of *Vermetus* sp., found growing on cable off the coast of Brazil; also *Siliquaria Australis* and *Scalaria pretiosa*, shells from the East Indian Seas.

Mr. Nash, specimens of *Helix arbustorum*, *H. nemoralis*, and *H. hortensis*, remarkable for their fine size.

Owing to the bad season, nothing further has been done towards adding to the case of local insects in the club-room. During one of

J. H. Baldock.

ELY CATHEDRAL.

EAST WINDOW AND LANTERN.

Dr. Hodgson.

SHIRLEY OAKS.

N. D. Roberts

BRUGES—ENTRANCE TO BÉGUINAGE.

the meetings, suggestions were made for starting an album of local natural history subjects, and it is hoped members will send in photographs of anything interesting.—Alfred Tarver, *Hon. Sec.*

Members Elected, 1903.

February 17th.—Miss M. G. Moore.
March 17th.—Miss D. L. Meihé, Mr. A. P. Diamond, Mr. John J. Parker.
April 21st.—Mr. Alexander C. Shore. Junior—Mr. H. C. Reynard.
May 19th.—Mr. Francis E. Wilkinson, Mr. James Williams.
September 15th.—Mr. E. W. Neales.
October 20th.—Miss S. White, Mr. F. C. Lloyd.
December 15th.—Miss Alice M. Bonus, Dr. T. Rutherford Allen, Mr. D. E. Goddard. Junior—Mr. W. G. Hinde.

Donations to the Library, 1903.

From Individuals.—*Althæa hirsuta* in Surrey by Mr. Salmon. Nature Notes, Mr. W. Whitaker. English Climatology, 1881–1900, Mr. Campbell-Bayard. Pulse and Rhythm, Mary Hallock-Greenewalt.

From Societies.—Proceedings of the Academy of Natural Sciences, Philadelphia; Annual Report of the Society for the Protection of Birds; Transactions of the West Kent Microscopical, Natural History, and Photographic Society, 1902; Report of the Underground Water Preservation Association; Journal of the Northants Natural History Society and Field Club, 1902; Journal of the Royal Microscopical Society; Journal of the Quekett Microscopical Club; Proceedings of the South London Entomological Society, 1902; Transactions of the East Kent Scientific and Natural History Society; Transactions of the Eastbourne Natural History Society; Report of the Meteorological Council, Additions to Library, &c.; Report of the Fernley Observatory, Southport; Report of the British Association Belfast Meeting, 1902; Journal of the Manchester Geographical Society; Transactions of the Manchester Microscopical Society; Transactions of the Norfolk and Norwich Naturalists' Society; History of the Berwickshire Naturalist's Club; The Photographic Journal; Bulletin de la Société Royale Malacologique Belgium; Bulletin of the Lloyd Library, Cincinnati; Annual Report of the Missouri Botanical Garden; Report of the Home Counties Nature Study Exhibition; The Rochester Naturalist; Transactions of the Brighton and Hove Natural History and Philosophical Society; Reports of the Peterborough Natural History and Scientific Society; Annual Report of the Yorkshire Philosophical Society, 1902.

From Publishers.—The British Journal of Photography; The Barnet Book of Photography; The Bromide Monthly; The Amateur Photographer; The Magic Lantern Journal.

Croydon Natural History and Scientific Society.—Receipts and Expenditure for the Year ending 31st December, 1903.

Receipts.

1903. December 31.	£	s.	d.	£	s.	d.
To Subscriptions (1901) received 1903	0	10	0			
,, (1902) ,, ,,	8	2	6			
,, (1903) ,, ,,	99	5	0			
				107	17	6
Donations to Meteorological Section—						
F. Campbell-Bayard, Esq. ...	5	5	0			
Baldwin Latham, Esq. ...	5	5	0			
J. Edmund Clark, Esq. ...	0	10	0			
G. Bower, Esq.	0	10	0			
C. H. Cooper, Esq.	0	5	0			
J. H. Crocker, Esq.	0	5	0			
Lt.-Col. C. N. Kidd	0	10	0			
W. W. Wagstaffe, Esq. ...	0	2	6			
Croydon Corporation... ...	0	10	0			
Croydon Rural District Council	0	10	0			
London County Council ...	0	5	0			
Southwark & Vauxhall Water Co.	0	10	0			
Sutton District Water Co. ...	0	10	0			
Underground Water Preservation Association	0	10	0			
Ditto for extra Papers ...	2	5	0			
Wimbledon Urban District Council	0	10	0			
				18	2	6
Sale of Transactions and Papers				0	8	6
Rent of Lockers in Dark Room				0	7	6
Amount received from A. Lloyd for Life Membership... ...	10	0	0			
Less paid for £10 19*s.* 6*d.* 2¾ per cent. Consols @ 91⅛	10	0	0			
Half-year's dividend on same				0	2	8
Balance due Treasurer				2	13	5
				£129	12	1

Payments.

1903. January 1.	£	s.	d.	£	s.	d.
By Balance due Treasurer				1	5	8
Rent of Club Room				10	0	0
Hire of Rooms for Meetings				4	0	0
Cost of Printing Transactions ...	30	17	6			
,, Illustrations to same ...	3	13	0	34	10	6
Fire Insurance				1	13	9
Meteorol. Committ.—Printing Rainfall Returns, Dec. 1902, to Nov. 1903				26	2	0
Photographic Committee—						
Rent of Dark Room	10	0	0			
Portfolio, Postages, &c.	1	4	8			
Gas for Lantern, cost of Lectures, &c.	2	17	1			
Subscrip. to Royal Photogr. Society	1	1	0	15	2	9
Botanical Committee, Postages, &c....				0	4	1
Geological ,, ,, ...				1	6	8
Zoological ,, ,, ...				0	2	4
Anthropological ,, ,, ...				0	7	10
Printing Monthly Circulars and Postages on same and on Transactions, &c.				14	0	4
Treas. & Sec. account for Stationery, Post., &c.				5	12	1
Professor Anderson's Lecture—						
Expenses incurred over same ...	6	1	1			
Less Sale of Tickets	4	10	0	1	11	1
Printing Catalogue of Books deposited at the Town Hall				5	9	6
Paid for Cleaning Glass Doors of Dr. Carpenter's Collection in Old School of Art Room, and Club Book Cases				0	10	0
Cost of Investing amount received from Life Membership Commutation				0	2	6
Subs. to—S.E. Union of Scientific Socs.	0	10	0			
,, Com. & Footpaths Preser. Soc.	0	5	0			
,, Photographic Survey of Surrey	0	5	0			
,, Soc. for the Protection of Birds	0	5	0	1	5	0
Assistant Secretary				5	0	0
Gratuities				1	6	0
				£129	12	1

SPECIAL FUND ACCOUNT.

£186 9s. 0d. CONSOLS.

1903. January 1.	£	s.	d.	1903. January 1.	£	s.	d.
To Balance	27	17	4	By Paid County Fire Office on Museum Case ...	0	2	6
Dividend, January	1	4	0	,, Repairing Lens of Lantern	0	9	10
,, April	1	4	0	,, Curator's Expenses over Museum Case ...	1	7	11
,, July	1	3	3	,, Balance	30	11	7
,, October	1	3	3				
	£32	11	10		£32	11	10

BALANCE SHEET.

1904. January 1.	£	s.	d.	1904. January 1.	£	s.	d.
To Balance, Special Account	30	11	7	By Balance due Treasurer	2	13	5
Subscriptions for 1904, paid in advance ...	6	2	6	Cash at Bank 30 17 6			
				,, with Treasurer 3 3 2			
					34	0	8
	£36	14	1		£36	14	1

We, the undersigned, having examined the books of the above Society, also accounts and vouchers relating thereto, hereby certify the above are properly drawn up so as to exhibit the true and correct view of the Society's affairs.

F. J. TOWNEND, *Hon. Treasurer.*
4th January, 1904.

GEORGE PHARE,
W. L. MOORE, } *Hon. Auditors.*

LIST OF MEMBERS.

(*Compiled to December* 31*st*, 1903.)

Date of Election.

1903. Adams, Dr. T. R., 171 St. James-road.
1897. Aldrich, Miss F. K., 14 Tavistock-road.
1899. Alexander, E., Grasmere, Birdhurst Rise.
1897. Allan, A. P., M.B., Crogdene, Croham-road.
1884. Allen, A. H., 10 Morland-road.
1899. Allen, F., 21 Duppas Hill Terrace.
1899. Allen, Mrs. F., 21 Duppas Hill Terrace.

1879. Backwell, R. J., 16 Penge-road, South Norwood.
1873. Bailey, E., 10 Lansdowne-road.
1898. Bailey, H., 10 Lansdowne-road.
1890. Baker, W. R., 9 Belmont Villas, Wallington.
1874. Baldock, J. H., F.C.S., Overdale, St. Leonard's-road.
1898. Bannerman, W. Bruce, F.S.A., &c., The Lindens, Sydenham-road.
1885. Barber, J. H., 92 Oakfield-road.
1898. Batten, J., The High Field, Bickley, Kent.
1871. Beeby, W. H., F.R.Met. Soc., Hildasay, Portsmouth-road, Thames Ditton.
1895. Berry, B. H., Rutherford, Pampisford-road.
Origl. Blake, W. J., Elmfield, Park-lane.
1903. Bonus, Miss A. M., Sarum, Radcliffe-road.
1902. Brant, R. W., 8 Moreton-road.
1884. Brebner, G. R., M.D., 232 London-road.
1880. Brewer, J. G. B., 12 Havelock-road.

1886. Campbell-Bayard, F., LL.M., F.R.Met.Soc., Cotswold, Wallington.
1899. Campbell-Bayard, S., Cotswold, Wallington.
1877. Carpenter, A. B., B.A., M.R.C.S., F.R.M.S., Bedford Park.
1898. Carr-Dyer, Mrs., Hazelea, Kenley.
1892. Carrington, L., Penmare, Tavistock-road.
1888. Cash, Wm., Coombe How, Stanhope-road.
1891. Chatterton, G., M.I.C.E., 6 The Sanctury, Westminster.
1891. Clark, Hy., 12 High-street.
1897. Clark, J. E., B.A., B.Sc., Lile Garth, Ashburton-road.
1882. Collyer, H. C., Breakhurst, Croydon-road, Beddington.
1900. Corcoran, B., Fairlight, Oliver Grove, South Norwood.
1893. Corry, J., J.P., Rosenheim, Park Hill-road.
1902. Corry, W. H., Rosenheim, Park Hill-road.
1895. Corser, Rev. R. K., Eastbrook, Park Hill-road.

1879. Cowdell, H. S., Cotleigh, West Wickham.
1899. Crowley, Mrs. A. C., 16 Chatsworth-road.
1901. Crowley, J. C., 16 Chatsworth-road.
1890. Culverwell, J. W., 119 Lower Addiscombe-road.
1874. Curling, G., Elgin House, Addiscombe-road.
Origl. Cushing, Thos., F.R.A.S., 2 Southside, Chepstow-road.

1901. Day, W. J., Glenrose, Avondale-road.
1903. Diamond, A. W., Bracklyn, Maldon-road, Wallington.
1875. Dickenson, Wm., M.A., F.G.S., Warham-road.
1897. Dighton, J., Fairlight, Altyre-road.
1884. Drage, J. H., Orlands, Willingdon-road, Eastbourne.
1891. Drew, H. W., F.R.C.S., Eastgate, Addiscombe-road.
1898. Druce, F., 65 Cadogan-square, S.W.
1893. Dukes, T. A., M.B., B.Sc., 16 Wellesley-road.
1891. Durham, R., Nuthurst, Park Hill Rise.

1879. Eaton, H. S., M.A., F.R.Met.Soc., National Club, 1 Whitehall Gardens.
1890. Edridge, Sir F. T., J.P., Bramley Croft, Bramley Hill.
1897. Epps, Miss A. M., Norfolk House, Beulah Hill, South Norwood.
1881. Epps, Jas., Jun., Norfolk House, Beulah Hill, South Norwood.
1901. Epps, Master J., Norfolk House, Beulah Hill, South Norwood.
1901. Epps, Miss B. M., Norfolk House, Beulah Hill, South Norwood.

1902. Fella, E. A., 48 Parson's Mead.
1883. Fenn, W. G., Heath Lodge, Thornton Heath.
1901. Filon, L. N. G., M.A., D.Sc., F.R.A.S., Godwin House, St. Augustine's Avenue.
1894. Fitzgerald A., Oaklands, Sudbury-road, Thornton Heath.
1899. Fox, C., The Chestnuts, Warlingham-on-the-Hill.
1901. Freshfield, E., LL.D., The Mint, Chipstead, Surrey.

1903. Goddard, D. E., Eaglehurst, Wallington.
1887. Goodman, C. H., Bryn Cottage, Whyteleafe.
1885. Gower, H. G., 55 Benson-road.
1902. Grant, R. C., Hale Edge, South Nutfield.
1885. Grundy, R. F., 8 Havelock-road.
1901. Gwatkin, Miss E. N., Croft Cottage, Liphook, Hants.

1902. Hall, Miss A., Ribblesdale, Foxley-lane, Purley.
1902. Hall, Mrs. H. D., Colleendene, Addiscombe-grove.
1899. Harvey, J. E., 11 Carew-road, Thornton Heath.
1888. Helps, J. W., A.M.I.C.E., F.C.S., 3 Tavistock-road.
1902. Hefferman, M., 82 Brigstock-road.
1887. Hinde, G. J., D.Ph., F.G.S., 24 Avondale-road.
1903. Hinde, Master W. G., 24 Avondale-road.
1881. Hobson, Dr. J. M., M.D., B.Sc., 1 Morland-road.
1900. Hobson, Miss M., 1 Morland-road.
1900. Hobson, Master F., 1 Morland-road.
1901. Hobson, Miss N. K., 1 Morland-road.
1902. Hobson, Master R. M., 1 Morland-road.
1896. Hogg, A. J., 43 Whitworth-road, South Norwood.

1886. Holmes, W. M., Glenside, St. Peter's-road.
1893. Hoole, A. P., The Willows, Sutton, Surrey.
1881. Hovenden, R. G., Heathcote, Park Hill-road.
1891. Hovenden, A., Oaklands, Haling Park-road.
1885. Hughes, Morgan, M.R.C.S., L.D.S., East Bridge, Addiscombe-road.
1896. Hunt, G. H., Leecroft, St. Peter's-road.

1890. I'Anson, W. H., 39 Dingwall-road.

1874. Jarrett, C., 2 St. John's-grove.
1899. Jast, L. S., 203 Brighton-road.
1896. Johnson, E. W., 50 Birdhurst-rise.

1888. Klaassen, H. M., F.G.S., Aberfeldy, Campden-road.
1897. Klaassen, Miss, Aberfeldy, Campden-road.

1877. Laing, R. A., Shirley Hurst, Radcliffe-road.
Origl. Latham, B., M.I.C.E., F.G.S., Duppas House, Old Town.
1892. Lincoln, J. G., Bank Chambers, High-street.
1896. Link, F., 43 Park Hill-road.
1901. Linton, Master F. J., 104 Park-lane.
1892. Lloyd, A. (Life Member), Coombe Wood, Coombe-road.
1891. Lloyd, F., Coombe House, Coombe-road.
1903. Lloyd, F. C., Southwood, Birdhurst-road.
Origl. Long, Hy., 132 High-street.
1874. Lovett, E., F.R.H.S., 41 Outram-road.

1902. Major, A. F., 30 The Waldrons.
1895. Malden, A., 26 Windmill-road.
1898. Male, H. C., M.D., 74 Birdhurst-road.
1886. Marshall, R., 31 The Waldrons.
1899. Martin, E. A., F.G.S., 23 Campbell-road.
1895. Martyn, J. W., 58 Westminster Mansions, Great Smith-street, Westminster, S.W.
1878. Mather, C. W., 47 Dingwall-road.
Origl. McKean, K., 1 Lewin-road, Streatham.
1886. McLachlan, R., F.R.S., F.L.S., 23 Clarendon-road, Lewisham.
1903. Meihe, Miss D. L.. Limatburg, Ambleside Avenue, Streatham.
1879. Mennell, H. T., The Red House, Park Hill Rise.
1895. Moore, G. W., Bryndhyrst, Dornton-road.
1903. Moore, Miss M. G., Bryndhyrst, Dornton-road.
1902. Moore, W. L., Bryndhyrst, Dornton-road.
1896. Moore, H. K., Chipstead, Chepstow Rise.
1898. Morris, W., C.E., The Kent Waterworks, Deptford.
1903. Morris, W. H., 1 Walpole-road.

1902. Nash, P. B., 135 Melfort-road, Thornton Heath.
1903. Neales, E. W., Boswell Court, South End, Croydon.
1901. Neligan, Mrs. Linton, 104 Park-lane.
1895. Newby, G. E., F.R.C.S., 12 Addiscombe-road.

1895. Olive, C. D., M.A., Rokeby, The Downs, Wimbledon.

1899. Page, Miss M., Woodlands, Coombe-road.
1892. Page, T. K. F., 9 Rosemount, Wallington.
1903. Parker, J. J., 11 Woodville-road, Thornton Heath.
1881. Parsons, H. F., M.D., F.G.S., Oakhyrst, Park Hill Rise.
1897. Parsons, Mrs. H. F., Oakhyrst, Park Hill Rise.
1900. Parsons, Miss E. G., Oakhyrst, Park Hill Rise.
1900. Parsons, Miss F. M., Oakhyrst, Park Hill Rise.
1893. Pascall, J., Ambleside, Addiscombe-road.
1891. Pelton, J. O., 26 Friends'-road.
1897. Petri, R., Hazeltryst, Havelock-road.
1870. Philpot, C. W., M.D., Uplands, Park Hill-road.
Origl. Price, G. N., 16 Warham-road.
1880. Pye-Smith, A., J.P., Willersley, 27 Park Hill Rise.

1885. Reed, L., F.I.C., F.C.S., Hyrst Hof, South Park Hill-road.
1903. Reynard, H. C., Holly Bank, West Ewell.
1902. Ridley, Dr. J. B., 32 Sydenham-road.
1895. Ritchie, Honble. C. T., M.P., 19A Wetherby Gardens, South Kensington.
1894. Robarts, N. F., F.G.S., 23 Oliver-grove, South Norwood.
1888. Roods, A., 67 Thornhill-road.
1877. Rymer, S. L., J.P., 14 Wellesley-road.

1892. Salmon, C. E., Clevelands, Wray Park, Reigate.
1888. Schmitz, J. H., J.P., 4 Lansdowne-road.
1903. Shore, A. C., 28 Wellesley-road.
1896. Shore, E. R., 28 Wellesley-road.
1896. Shore, H. H., 28 Wellesley-road.
1895. Slack, J. Watson, 27 Birdhurst-road.
1899. Smedley, E. A., 173 Albert-road.
1884. Smith, Dr. S. Parsons, Parkhyrst, Addiscombe-road.
1898. Stanley, J. H., Sundial College, Banstead-road, Purley.
Origl. Stanley, W. F., F.G.S., &c., Cumberlow, Lancaster-road, South Norwood.
1902. Stebbing, W. P. D., F.G.S., Frith Park, Epsom.
1896. Stokes, F., 125 Melfort-road, Thornton Heath.
1878. Straker, E., 5 Park-lane Mansions.
1874. Swaine, J. C., Quarry Hill, Stanhope-road.
1882. Syms, J. E., Stanton Villa, Stanton-road.

1897. Tarver, A., Polruan, Stuart-road, Thornton Heath.
1898. Tate, A., Downside, Leatherhead.
1880. Thompson, F., Lynton, Haling Park-road.
1892. Thorpe, C., Selborne, Chatsworth-road.
1899. Topley, E. E., Ingleside, St. Augustine's Avenue.
1901. Topley, Master C., Ingleside, St. Augustine's Avenue.
1898. Topley, W. W., 46 Friends'-road.
1902. Townend, Master C. H., Harefield, Dornton-road.
1902. Townend, F. H., Harefield, Dornton-road.
1896. Townend, F. J., 11 Park Hill Rise.

1900. Voss, W. A., F.C.S., Melrose, Whitworth-road, South Norwood.

1877. Walker, T., C.E., Hazelhyrst, Warrington-rd., Duppas Hill.
1876. Walton, A., The Homestead, Bedford Park.
1897. Ward, Miss C., 42 Temple-road.
1877. Warner, A., 2 Grosvenor Villas, Holmesdale-road, Selhurst.
1881. Waterall, N., Waddon Lodge, Waddon.
1898. Webster, R. T., Claremont, Radcliffe-road.
1895. Weightman, A. J., Endsleigh, Chepstow-road.
1897. Weightman, W. A., Endsleigh, Chepstow-road.
1877. Wenham, W. P., 275 London-road.
1896. Whitaker, W., F.R.S., F.G.S., Freda, Campden-road.
1899. Whitaker, Miss M. de F., Freda, Campden-road.
1903. White, Miss S., Tweedbank, Whitworth-road, South Norwood.
1900. Whitley, Miss K., 11 Chichester-road.
1887. Wild, A. S., 28 Canning-road.
1903. Williams, J., Ridgeway, Sanderstead Hill, South Croydon.
1903. Wilkinson, F. E., Westbury, St. Paul's-square, Thornton Heath.
1901. Willock, E. H., 113 London-road.
1902. Willson, Miss A. E., Limatburg, Ambleside-avenue, Streatham.
1889. Wise, H. R., Beachfield, Bramley Hill.
1895. Wissenden, A. C., 50 Canning-road.
1887. Wratten, F. C. L., Hellingley, Dingwall-avenue.

Honorary Members.

1885. Berney, F. L., Ravensbourne, Kamboo, Queensland.
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1894. Sarjeant, W. Low, New Zealand.

TRANSACTIONS

OF

THE CROYDON NATURAL HISTORY AND SCIENTIFIC SOCIETY.

1903—1904.

1.—Comets: their Appearance, Nature, and Origin.

By L. N. G. Filon, M.A., D.Sc.

(Being Notes of a Lecture delivered April 21st, 1903.)

When our ancestors looked up at the heavens, they were occasionally startled by the appearance of extraordinary objects, consisting of a bright head and nucleus, followed by a huge luminous streamer or "tail." It was this tail which impressed most the early observers. The Greeks compared them to streaming hairs; hence the name of "comets," or hairy stars, given to these objects.

These trails of fire, which stretched across the sky for months at a time, were considered, until comparatively recent times, as dreadful portents, which boded evil to nations and princes. Comets were seen at the time of Cæsar's death, and the Latin poet Vergil refers to them as "diri cometæ," terrible comets.

A comet was seen in 1066, the year of the battle of Hastings, but, this time, the Norman chroniclers enlisted the comet as their ally, and it is pictured on the Bayeux tapestry as an omen favourable to William the Conqueror.

The tale even runs that a Pope, Calixtus III., went so far as to excommunicate the comet of 1455.

Even in the nineteenth century, something of superstitious awe still clung to comets. Thus the celebrated comet of 1811 was supposed to be connected with the downfall of Napoleon; it passed perihelion on the day when the Russians burnt Moscow.

It is also known as the comet of the "Comet Year." The summer of that year was exceedingly hot, and the wine of the "Comet Year" long enjoyed a great reputation.

The origin and nature of comets were (and to some extent still are) the cause of much speculation.

The reason why comets were regarded with so much fear was the irregularity of their appearance and disappearance. Like the sun, moon, and planets, they moved among the stars; but, unlike them, they did not return at periodic intervals, or follow regular courses.

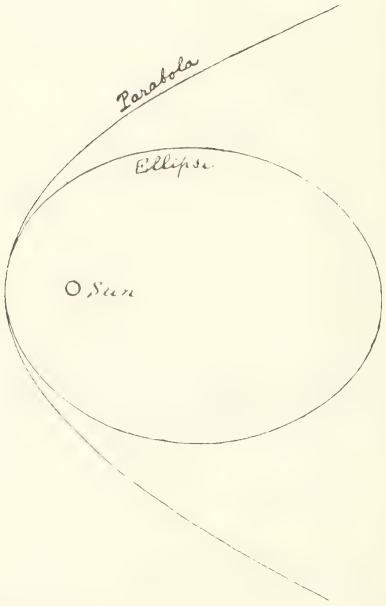

Fig. 1.—Elliptic and Parabolic Orbits touching at Perihelion.

At first sight, therefore, it appeared that they might have no connection with the celestial bodies, and the old Greek philosophers, among them Aristotle, believed that they were earthly phenomena, meteors of the upper air, much as we now look upon the Aurora Borealis.

Tycho Brahe, who lived at Prague, in Hungary, in the sixteenth century, was the first to show, by actual observation, that they were more distant than the moon. This he did by comparing the apparent positions of the comet as seen from stations

four hundred miles apart. Had the comet been at all near the Earth's surface, the change in its bearings would have been very large. It was found to be negligible.

Since the distance of comets is so great, it follows that their dimensions, in particular the length of their tail must be enormous.

Tycho Brahe supposed that comets moved in circles, the circle being the "perfect curve," and the only one worthy of a heavenly body, according to the notions of his day.

Kepler, one of Tycho Brahe's pupils, supposed that comets moved in straight lines; and he looked upon them more or less as living creatures, travelling through space with will and purpose, "like fishes in the sea."

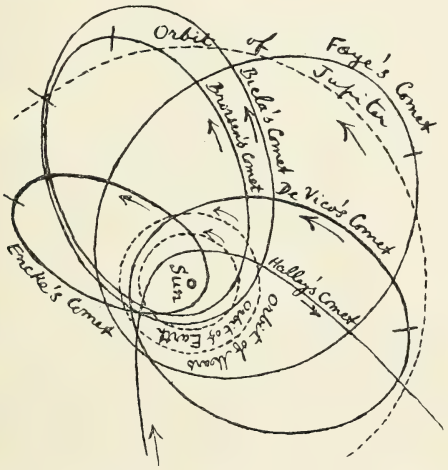

Fig. 2.—Orbits of Short-period Comets.

Kepler's name is honoured by the discovery that planets do not move in circles, but in oval curves called ellipses, the sun being, not at the centre of the curve, but somewhat eccentrically placed.

Newton showed that a comet entering the solar system from a large distance away, would move in a very elongated ellipse. If the original distance were infinitely great, the ellipse would be infinitely elongated. A curve of this kind is called by mathematicians a parabola. It is the same as the path of a projectile under gravity.

This deduction from the law of gravitation was verified by observation and the astronomer Halley calculated the paths of all the comets then known. He discovered that certain comets

which had appeared in 1531, 1607, and 1682, followed very nearly the same path; and he also found that there were records of great comets in 1066, 1145, 1301, 1456, 1531. The inference was that all these were really different appearances of one and the same comet, returning at intervals of about seventy-six years, intervals such as 1145–1301 (156 years), and 1301–1456 (155 years), were accounted for by the comet not having been seen under sufficiently favourable conditions at the intermediate return.

Halley predicted that this comet moved, not in an accurate parabola—no comet moving in a parabola can ever return—but in a very long ellipse, and he announced its return for 1758. His prediction was fulfilled, but Halley did not live to see it; he died sixteen years before the reappearance of his comet.

Since then the latter has been observed at every return. It was last seen in 1835, and is due again in the summer of 1910.

The existence of Halley's comet shows that all comets do not move in parabolas and go out of our ken for ever, but that some move round the sun like the planets and are permanent members of the solar system.

Since Halley's day, several other comets, returning at comparatively short intervals, have been discovered. Out of two hundred and seventy comets whose paths have been calculated, fifty have been found to move in ellipses, and more are doubtful, Only thirteen, however, have actually been observed more than once.

The accompanying woodcut (Fig. 2), which is reproduced from Professor Young's 'General Astronomy' (slide exhibited), shows the paths of some of the best known of these comets. The cross-cut on each of the orbits marks the *node* or point where the paths of the comets cross the plane of the solar system.

These *nodes* are all close to the orbit of Jupiter. Jupiter is the largest and heaviest of the planets and his attraction disturbs the comets and pulls them down nearer his own orbit.

The comet of shortest known period is Encke's comet, discovered in 1818. It returns at intervals of three years and four months. It presents a curious and hitherto unexplained anomaly: its period is being gradually accelerated, so that it threatens, eventually, to fall into the sun.

Encke's comet is a faint object. All the bright periodic comets return at such long intervals that the ancients never thought of identifying them.

Structure of Comets.—For purposes of description we distinguish three parts in a comet:—

(A) *The Head.*—This is a hazy cloud of faintly shining matter, On one occasion (1882) it was preceded by a fainter forerunner or "sheath," a luminous shadow, so to speak. The diameter varies usually from 40,000 to 100,000 miles.

FIG. 3.—THE COMET 1901 (I.).

(Reproduced by kind permission of H.M. Astronomer at the Cape of Good Hope.)

To face p. 5.

The head of the comet of 1811 at one time measured 1,200,000 miles, and its volume was about three times that of the sun.

(B) *The Nucleus.*—This is the name given to a bright star-like point near the centre of the head. Its actual diameter ranges from 8000 miles to 100 miles.

The nucleus appears to be the seat of considerable activity. Its dimensions are continually changing, and it throws out occasionally bright prominences which are called *jets*. It is often surrounded by bright concentric rings called envelopes.

Fig. 3 (Plate) shows a picture of the comet 1901 (I.), observed at the Cape Observatory. The black streak behind the nucleus should be noted. The comet seems to leave a kind of double wake in space, shedding luminous matter on either side. This brings us to—

(C) *The Tail.*—This is by far the most characteristic part. Its length varies considerably, but has been known to reach 100,000,000 miles. The volume of the tail of the great comet of 1882 was more than 8000 times that of the sun.

That the matter composing the tail is exceedingly attenuated, follows from the fact (slide shown) that stars shine through the tail of a comet with undiminished brilliance.

But we have other reasons to believe that comets are extremely light bodies. We have seen how easily they are influenced by the attraction of Jupiter. The comets themselves, however, produce on Jupiter no appreciable effect. Thus Brook's comet of 1889 actually passed inside the orbit of the nearest satellite of Jupiter. Its own path was completely changed; yet the disturbing effect on the planet's path was practically *nil*.

Now it is a well-known fact, that if two bodies react on one another, the effects produced in each are inversely as the mass. Thus, if a cannon be fired, the velocity of recoil is to the velocity of the shot in the inverse ratio of the mass of the cannon to that of the shot. If the velocity of the bullet be given, then the lighter the bullet, the less the recoil. In the same way with Jupiter, the lighter the comet, the less its disturbing effect.

Calculation from data of this kind has shown that the mass of comets is certainly less than one 100,000th of the Earth's mass.

We have then to suppose the matter of comets to be made up either of very attenuated gas, or of very finely scattered dust, "pin's heads several hundred feet apart," as one authority has described it.

Origin and Nature of Tail.—The appearance of a comet's tail suggests, at first sight, a trail of matter left behind by the head in its course, like the smoke from a locomotive. But this appearance is deceptive; for, if this were so, the tail would always lie in the wake of the comet. On the contrary, the tail of

a comet is found to be constantly directed *away* from the sun, so that as the comet moves away from the latter, the tail precedes it. Thus the analogy of the locomotive smoke would be improved if we suppose a wind, directed from the sun, always blowing the smoke (tail) outwards.

This hypothesis is confirmed by the fact that the tail is usually not straight, but somewhat curved, because the nucleus of the comet, which is nearer the sun, moves faster than the tail, which is more remote.

The formation of this tail is explained by the supposition that the nucleus throws out matter towards the sun (as we have seen to be the case with the jets and envelopes), and that this matter is somehow repelled by the sun.

The tail of a comet is thus analogous to a vertical jet of water in a garden, the drops curving outwards and falling under the Earth's attraction. This is illustrated by Fig. 4, which is also

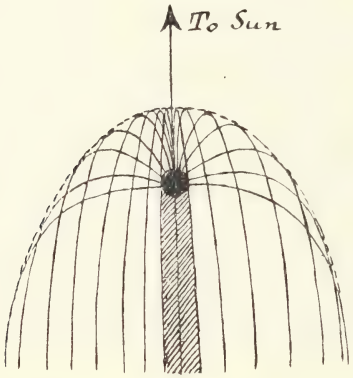

Fig. 4.—Formation of a Comet's Tail by Matter expelled from the Head.

taken from Professor Young's very instructive treatise. When viewed sideways, the drops will appear to be more numerous on either side, even though they really are distributed symmetrically, and thus we have the explanation of the dark streak behind the nucleus.

Cause of the Repulsion.—The question, how is this repulsion produced? remains a very vexed one.

One theory brought forward is that the sun and the particles of the comet's tail are both electrified. Bodies charged with electricity of the same kind repel one another.

Another cause suggested is the pressure of light. According

to modern theories of optics, we have to suppose that light exerts a certain pressure on the opaque bodies it encounters.

The fact that we can get no experimental evidence of such a pressure is no argument against its existence, for its calculated value is far too small to produce any effect which our instruments could detect in the case of the familiar objects which surround us.

But when we have to deal with the excessively fine dust, of which we suppose the material of the comet to be formed, the pressure of light may be large enough to overcome the sun's gravitation.

For a pressure is proportional to the area over which it acts, but the force of gravitation is proportional to the mass of the body, and therefore to its volume.

Now if we have a cube of one inch side, made of material weighing one pound to the cubic inch, if we hold it up in the hand, the pressure upwards, which we have to exert upon its base to keep it balanced, must be exactly one pound weight; and this pressure is exerted upon an area of one square inch, so that it is one pound weight per square inch.

But if we make a cube of side half an inch, of the same material, its volume is only one-eighth of what it was before, and its weight accordingly one-eighth of a pound. To hold it up, my hand has to exert upon its base, which is one-fourth of a square inch in area, a total pressure of one-eighth of a pound weight, that is, of half a pound weight per square inch, or exactly half the previous pressure.

And so on. If our cube, still made of the same material, be reduced to one-tenth of an inch side, its weight is reduced to one-thousandth of a pound, and the pressure I have to exert to balance gravity is one-thousandth of a pound weight upon an area of one-hundredth of a square inch—*i. e.* one-tenth of a pound weight per square inch.

Thus as we diminish the dimensions of a body, keeping its density the same, a lesser and lesser pressure is found to balance gravitation. Ultimately it will be found that, if only our particles be taken small enough, any pressure intensity, however small, will be found able to overcome any gravitational attraction, however large.

In a precisely similar way, if you take powdered lead and fair-sized lead shot, and let them fall, the shot will fall to the ground far more rapidly than the powdered lead. This is due to the resistance of the air, which is of the nature of a pressure, and is proportional to the area of the particles. In a vacuum the powdered lead and the shot would fall with the same rapidity.

We see, then, that in the case of comets it is conceivable that the sunlight should exert a sufficient pressure on the minute

particles of which the comet is composed to overcome the solar attraction.

Whatever may be the cause, there is no doubt that the tail is due in some way to the solar action, for the comet only acquires its tail when it gets within a certain distance of the sun, and it loses it as it leaves the solar neighbourhood.

Multiple Tails. — The repulsion theory derives considerable support from the fact that a very large number of comets have several tails (see Fig. 5). Now it seems probable that the pressure of light is independent of the material on which it is exerted, so that, other things being equal, heavy matter will be less forcibly repelled than light matter. Hence we see why it is that the material of a comet's tail should sort itself into several streamers.

Bredichin classified comets' tails into three main types (shown on Fig. 5). The straight tails, which point nearly away from the sun, and which one would expect to be composed of the lightest matter, he assumed to consist chiefly of hydrogen.

The middle tail, which is usually the brightest and is much more curved, he supposed to contain gases which are known as hydrocarbons—*e. g.* the gas in the blue part of an ordinary gas or candle flame.

On examining the light from these tails with a spectroscope, the existence of some such gas, in the middle tail, has been established beyond question.

The hydrogen tails are usually too faint for their light to be analyzed, and so this hypothesis still remains doubtful.

Finally, in certain cases a third tail can be observed—a short brush—still more strongly curved than the main tail.

Bredichin states that such a tail would be composed of iron and sodium; but these tails are very rare, and all the evidence we have on this subject is, that the great comet of 1882, when it approached the sun, brightened up considerably, and its light showed evidence of the presence of iron and sodium and other metals.

The Speed of Comets.—The speed of comets is highly variable. When at a large distance from the sun they move very slowly, quickening up their pace as they approach nearer.

The comets of 1668, 1843, 1880, and 1882 all came very close to the sun, and went round it at a tremendous speed. The comet of 1843 circled round the sun, at perihelion, at a distance from the centre less than the solar diameter, and went through a half-turn in something under three hours, corresponding to a maximum speed of 320 miles per second.

Again, the comet of 1882 went round the sun so fast that its tail could not follow it, and parted company; so that the comet, like the sheep of the story, left its tail behind it, but when it re-

appeared on the other side of the sun, unlike the sheep, it grew a new tail.

Origin of Comets.—It is probable that comets are bodies floating about in interstellar space, and come only accidentally within the reach of the solar attraction.

With regard to the periodic comets, it is supposed that they, too, were chance visitors, but that, in their course, they have passed near one of the big planets, Saturn or Jupiter, and been "captured" by them—that is, prevented by the planet's attraction from wandering away again into space. They are thus naturalized citizens, not native born members of the solar system.

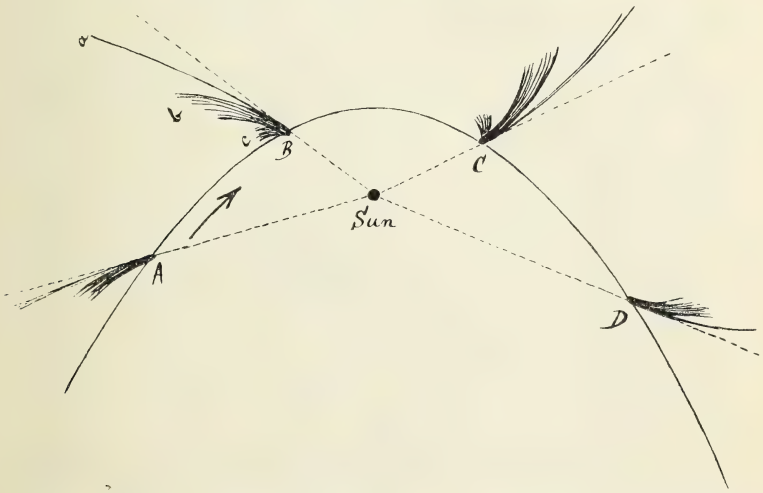

FIG. 5.—A, B, C, D. VARIOUS POSITIONS OF A COMET NEAR PERIHELION, SHOWING DEVELOPMENT AND ORIENTATION OF THE VARIOUS TAILS.

a. Hydrogen tail. *b.* Hydrocarbon tail. *c.* Sodium and Iron tail.

Fate and End of Comets.—Since comets are continually losing part of their substance by means of their tail, it follows that they cannot last indefinitely: eventually periodic comets must fritter themselves away.

But it also happens that, even before this occurs, comets break up. Thus a comet, named Biela's comet, was discovered in 1826 with a period of about $6\frac{1}{2}$ years. At its return in 1846 it had broken up into two fragments. These two halves were again observed at the next return, 1852, since when nothing has been seen of Biela's comet. But on the night of Nov. 27th, 1872, as the Earth was passing through the old track of the vanished comet, it encountered a brilliant shower of shooting stars. The

phenomenon was repeated, under the same circumstances, in November, 1886. The motion of the meteor stream is the same as that of the original comet, and there seems little doubt that they are the scattered remnants of Biela's comet.

Other comets have since then been found to break up. (Slides were shown of Brook's comet, 1893 (IV.), breaking up; and of Swift's comet, 1892 (I.), developing a second nucleus.)

Danger of the Earth from Comets. — The possible danger to the Earth from comets has been the subject of much discussion, and has given rise in recent years to various "comet scares."

There are two possible causes of such danger:—

(*a*) The Earth may strike a comet. This is quite possible: according to calculation, it is likely to occur, on an average, once in 15,000,000 years. If it did occur, it is highly probable that the result would be simply a grand display of shooting stars, the matter of the comet not being solid enough to hurt the Earth much. The Earth has actually passed through the tail of a comet without any result.

(*b*) A comet may fall into the sun, and the heat developed may be such as to be a grave danger to organic life on the Earth. Apart from the improbability of such a collision (it can be shown that such an event is far more unlikely than a collision with the Earth, because the comet must initially be heading straight towards the sun, if it is to occur at all), the mass of a comet is so small that it would only generate as much heat as the sun will radiate in eight or nine hours. But this heat will be developed *inside* the sun, below its photosphere, and will only be gradually liberated. The effect on the Earth will be practically *nil*.

So that, after all, comets are very harmless objects, although at first sight they make such a brave show. We, however, are wiser than our ancestors, and look upon them as mines of information rather than as harbingers of death. It is one great regret of astronomers that, since astronomical photography has been extensively introduced, no great bright comet has been kind enough to sit before our cameras.

2.—Notes on a Section of Clay with Flints near Woldingham.

By N. F. Robarts, F.G.S.

(Read May 19th, 1903.)

The recent excavations upon the crest of the escarpment of the North Downs slightly to the north-west of Oxted Chalk Quarry, made during the construction of the new fort at that spot, have afforded an opportunity for examination of a section which may be usefully recorded, as not only are sections of any depth uncommon upon the higher parts of the Downs, but the position chosen for the excavation has fortunately been one which geologically has some features of peculiar interest.

The higher parts of the Chalk, in the district referred to, are covered with "Clay with Flints," as shown on the Survey map; for the Clay having been removed by denudation during the erosion of the valleys, is now only found on the intervening hills.

Sections in the Upper Chalk almost invariably lead to the discovery of "pipes," the contents of which inform us as to the strata originally overlying the Chalk; and those members who a year or two ago visited the Kingswood cutting on the Chipsted Valley Railway will recollect the grand show of "pipes" filled with Thanet Sand and other Lower Tertiaries which was then visible in the cutting.

The fort at Woldingham, in making the foundations of which the section I am about to describe was exposed, lies at an elevation of 860 ft. O. D., and the only Tertiary bed known near it is the small outlier of Oldhaven pebbles and sand about 200 yards to the south-east. The bed of pebbles appeared to be of no great depth, probably not more than 10 or 15 ft., and is therefore probably but a remnant of the original bed, which—a mile to the south, at Worms Heath—has a thickness of 40 ft., if the pebble-beds were continuous over this area, about which I have some doubt.

This outlier appeared on the western side to contain a bed of sand, but the ground has been so disturbed by digging for gravel that it was almost impossible in the present state of the section to

decide upon the relative position of the two beds of sand and pebbles.

The excavation of the fort showed that the whole surface of the chalk was honeycombed with pipes, and in an area of about thirty yards square the whole of the Clay with Flints appears to have sunk more or less into the underlying pipes. I should draw a ttention to the character of the Clay, which was of a peculiarly bright red, and free from any admixture of other rocks than Flint.

The pipes were apparently absolutely conterminous, and could be traced in many places, not by the usual intervening pillars of chalk, but solely by the disturbance of the superior strata which have been let down into them.

The greatest depth of the excavation was about 14 ft., exposing the side of a pipe, which evidently ran to a greater depth. The highest chalk between some of the pipes was about 6 ft. below the surface, but above the chalk divisions it was possible, by noting the different strata which had been let down, to trace the sides of the pipes, although the chalk between them had perished.

In spite of the adjacent outlier of Oldhaven Pebbles being so near, in no instance was any of this pebble-bed to be found in the pipes, which in every case but two appeared to be lined at the side with green-coated flints, and filled up to the subsoil with Red Clay with Flints. In the two cases referred to, one pipe contained in its centre a reddish clayey gravel composed of very small tertiary pebbles with some small angular flints, which *may* have formed part of the Southern Drift, but I could not find in it any chocolate-coloured flints or implements, or Lower Greensand rocks.

The other pipe contained, enclosed in the Clay with Flints, a buff-coloured clayey sand with a very few small greenish flint pebbles. evidently not derived from the Oldhaven Pebble-bed, unless the colour of the pebbles had been altered by the matrix in which the stones were lying, and thus their original colour had been lost.

It was clear from the position of the sand in the centre of the pipe surrounded by "Red Clay with Flints" that the sand had been superior to part of the Clay with Flints, and may have been derived from the sandy Oldhaven beds. If this was the case, as there were no Oldhaven Pebbles in the pipe, the Clay with Flints must either have been formed before the sand was deposited, or formed beneath it since the sand was laid down.

But the supposition that this clayey sand, which is not unlike the sand on the north-west of the pebble outlier, was deposited on the Red Clay with Flints, and that the latter was of its present thickness, does not seem probable, as the great depth of the surrounding clay would, in a comparatively narrow pipe,

prevent the sand from sinking to any depth down the centre of the pipe, since the underlying clay would naturally fill up any narrow depression.

I think these narrow pipes with sand in the centre of the pipe, with considerable depth of surrounding clay, go to prove that the clay was not of great thickness when the pipe began to form, but that there must have been some clay before the sand began to sink, and that the clay has gone on thickening ever since, so that now there is a great thickness of clay surrounding and overwhelming the sand.

The very large quantity of Flints, all unbroken and unrolled, contained in the Clay of this section supports the theory that the latter is the insoluble portion of the Chalk; in no other way does it seem possible that such large unrolled Flints could be preserved. We are not accustomed to seeing in our gravels or elsewhere Flints of their natural size—even in Chalk-pits they are usually broken as they are uncovered, and only disclosed a few at a time; but in a section like the one under consideration we see them of full size, and freed from their original matrix.

It is unfortunate that this excavation was not made on a spot where there is undoubted Southern Drift, as such a section, at a spot where that drift was exposed upon the surface at an elevation of 860 ft., might have been very useful in elucidating some of the problems connected with that gravel and its accompanying eolithic implements.

At all events such a section shows the desirability of more closely defining and mapping the different deposits comprised under the term "Clay with Flints." Clay containing unrolled Flints, free from an admixture of other rocks, formed, as far as we know, by the dissolution of the Chalk, might be always specified as "Red Clay with Flints"; and when other rocks than unrolled Flints are associated with Clay, the formation should be termed "Clay with Southern Drift," or whatever other term may best describe the formation, according to its specific character.

I particularly think this is necessary for the purpose of defining the implement-bearing Clays, for I note that Prestwich, in 'Primitive Characters of the Flint Implements of the Chalk Plateau of Kent,' refers to Mr. Harrison having found eoliths in Red Clay with Flints; but I believe it is the fact that, though Mr. Harrison has found them on the surface of Red Clay with Flints, as defined above, he has never found them *in* any Clay which has not contained Southern Drift; and I doubt if Mr. Bullen's implement, also referred to by Prestwich, was found in the Red Clay with Flints.

It is satisfactory to those who hold that eoliths are only to be found in Southern Drift, or gravels derived from same, that no forms of that description were found in these undisturbed beds of

Flint lying undisturbed in the remains of their original matrix, though this is only negative evidence.

As building operations may take place during the next few years at other points near the escarpment, it would, I think, be very desirable to keep a close watch upon any excavations, as new facts may be obtained about both the Red Clay with Flints and the Southern Drift, more especially about the latter.

3.—The Plateau Gravel, Upper Norwood, and associated Eolithic Implements.

By N. F. Robarts, F.G.S.

(Read May 19th, 1903.)

A few weeks since the Croydon Corporation commenced making a drain on South Norwood Hill, from about 150 yards below Grange Hill to the corner of Beulah Hill and Church Road. As the trench approached the stables of 'Falkland Park,' I noticed gravel being thrown out, and I thereafter watched the progress of the work almost to its final point. It is seldom that the gravel upon the top of Norwood Hill is exposed, the whole neighbourhood having been built upon, though, in view of the number of houses to let, there is, I should think, a strong probability that before long some of the larger ones will be pulled down, and roads cut through the grounds, which may be of advantage to geologists, if not to the other residents.

Two or three years since a shallow trench was dug along Church Road for the purpose of laying electric mains, but this was only about two feet in depth, and scarcely touched the gravel *in situ*. The drain which has recently been made was carried to a uniform depth of five feet, and the lower part was throughout almost the entire length in undisturbed clay or gravel.

Our member, Mr. E. A. Martin, F.G.S., writing in 'Science Gossip,' September, 1900, refers to the gravel, under the title of Westow Hill Gravels, as follows:—"Recent excavations have shown that the gravel is here of considerable extent, and in a direction north to south along Church Road it cannot be far short of a mile in length. . . . The excavation in which the wires were laid was about four feet deep, but in some places somewhat deeper. From Grange Hill to All Saints Church there was little or no 'soil,' the road material resting on a

sandy loam. Midway between the two was a peculiar patch of pinkish-coloured loam with rounded pebbles." (I may say I did not closely watch this trench three years ago, but my recollection of it was that it did not exceed three feet in depth.)

Mr. Martin further remarks upon the sand and gravel near Upper Beulah Hill, which, he states, "resembled Croydon gravel," and near the house 'St. Ives' "contained a large number of rounded flint pebbles." I am sorry Mr. Martin did not record the character of the gravel and its constituents more particularly, as this seems to me to be the most important matter respecting this isolated sheet of gravel.

I have endeavoured to find other records respecting this gravel, but they seem to be very meagre, though there must have been many sections exposed when the houses from South Norwood Hill to Westow Hill were built; but at that time there was unfortunately not the same interest felt in gravels as there has been since it was discovered that many in the South of England contained flints bearing evidence of human workmanship.

I know of no recorded finds of implements from this patch of gravel.

Mr. Whitaker, in his 'Memoir on the Geology of the London Basin,' 1889, vol. i. p. 383, referring to Mr. F. J. Spurrell, says:—"The gravels of the Norwood hills are referred to as the highest of the old Wandle, but it seems possible, if these are River Gravel, they may belong rather to the old Thames." Later (p. 427):—"Besides this [the gravel at Wandsworth Common] the only high isolated patches are at Clapham and at Balham, besides the still higher ones of Lower and Upper Norwood, as to the classification of which there may be some doubt, especially with the highest and most southern."

It must be borne in mind that we are dealing with a very high gravel, the altitude of this patch being from 350 to 380 ft. above O.D., or about 200 ft. above the highest terrace of Wandle gravel at Croydon or Thornton Heath, and about the same height above the Thames as the gravels at Wandsworth or Clapham.

The only other high patches of drift anywhere near Norwood are those at Shooter's Hill to the east and Wimbledon Common to the west, both at a considerable distance, with the still more distant patches at Telegraph Hill, Swanscombe and Dartford Heath to the east, and Kingston Hill to the west.

The fullest reference that I can find to the gravel under our notice is that made by Prestwich in his communication to the Geological Society, "On a Southern Drift in the Thames Valley, and its Relation to the Westleton Beds," &c.* This gravel is there referred to as follows:—

"Surrey. Here it is on the Tertiary hills, and not on the

* Q. J. G. S., vol. xlvi. 1890, p. 158.

Chalk-downs that we find the best exhibition of this Southern Drift. A thin bed of it resting on London Clay caps West-Ho Hill, Norwood. The following is a detailed section taken some years since :—

	FT.	IN.
a. Surface soil...	2	0
b. Loamy gravel	1	0
c. Fine ochreous gravel, with veins of grey sandy clay	1	0
d. Grey sandy clay	0	6
e. Yellow gravelly sands	2	0
f. Grey sandy clay	0	6
g. Ochreous sand	1	3
h. Grey sand	0	3
i. Coarse ochreous gravel	2	0

According to one specimen I kept, this gravel consists of :—

1. Subangular flints, unstained and stained brown, in largest proportion.
2. A considerable proportion of Tertiary flint pebbles, some broken and worn.
3. About 10 per cent. of subangular fragments of chert and ragstone.

With one pebble of a hard sandstone or quartzite (Tertiary ?), and one small pebble of quartz.

This gravel extends southward all along the top of this hill at a height of 360 to 380 ft. above O. D."

Now to describe the section in question.

On South Norwood Hill, at a little below 350 ft. above O. D., the gardens on the east and the bank on the west side of the road are seen to contain a considerable number of pebbles and subangular flints, some of the latter being stained brown.

Below 350 ft. above O. D. the trench, after passing through one to two feet of made soil, was in solid London Clay, but, on reaching the notice-board giving warning to cyclists opposite to 'Court Royal,' the clay had a mottled appearance, and if seen by itself might readily have been taken for a clay of the Reading beds ; this was followed to the north in the lower half of the cutting by about 30 ft. of irregular grey gravel, 9 ft. of yellow clay, 6 ft. of yellow and grey gravel, 6 ft. of sandy yellow clay, 9 ft. of yellow clayey gravel, followed by sandy yellow clay up to the gate of 'Thornaby'; then 25 ft. grey clayey gravel, 10 ft. clay, 7 ft. small sandy chalky gravel, 10 ft. clay ; then, at the corner of Grange Hill, about 50 ft. yellow clayey chalky gravel, made up entirely of small Tertiary pebbles, with a very few large, and hardly any of intermediate size, with some subangular flints,

principally stained brown, but containing no other rocks whatever; neither quartz pebbles, quartzites, lower greensand cherts, ragstone, or ironstone.

From Grange Hill to the corner by the church the section was of much the same character as that detailed above, except that the gravels became of a brighter yellow.

There were some patches which were of a greyish pinkish colour, but these I considered had been disturbed or discoloured by gas, and of them I have taken no notice.

The gravel, where passed through, always remained at the bottom of the trench; in no case was the underlying clay exposed, so that the depth of the bed was not ascertained, but from the way the gravel held the water after rain, although on the slope of the hill, I think the gravel was of little depth below the trench.

As to the materials composing the gravel, these appeared to be different to those noted by Prestwich at West-Ho Hill, as I could find none of the "10 per cent. of subangular fragments of chert and ragstone," or any quartzite or quartz pebbles.

The chalky character of the gravel in some patches, however, gave a strong indication that it had come from the chalk on the south, and was not an old Thames gravel, *i. e.* had not come from the west.

The pebbles and subangular flints were usually embedded in such a very adhesive clayey matrix that it is quite possible that other rocks may have been present; it was very difficult to ascertain what the stones were until the clay was removed, and perhaps, had the works been left open long enough for the rain to have more thoroughly removed the clay from the stones, other materials besides flint might have been recognized.

There was, however, no doubt about the brown-stained subangular flints, some of which had the original crust entirely removed, whilst others had a whitish crust in parts, the remainder being stained brown.

I carefully examined these and all subangular flints for traces of human workmanship or use, but those not stained brown gave no indication of either; but I have placed upon the table some specimens of the brown-stained flints, which in my opinion give undoubted evidence of chipping by design, rude as it is, and one specimen which, though it has been subsequently broken, gives signs of use. This, moreover, is a common form of eolith, and not much rolled.

Whatever doubt may be thrown upon the age of rude implements from the surface on the escarpment of the downs or elsewhere, there is no doubt of those upon the table having been taken from undisturbed gravel at a height of 350 ft. above O. D.

and 200 ft. above the highest terrace of the Wandle, thus making them rank amongst the oldest yet known.

When further sections are made in this gravel, and attention is given to the search for eoliths, I have little doubt that other specimens will be found to confirm those to which I desire to direct attention.

Meanwhile it is well to consider the position of this high-level gravel, if it has been derived from the North Downs and Wealden area.

The nearest point where the height of 380 ft. above O. D. is reached is the Addington Hills, nearly three and a half miles distant, the intervening valley having been cut out to a depth of about 250 ft., as the lowest point between Norwood and Addington Hills is about 125 ft. above O. D., whilst towards Beckenham is a few feet less. We have therefore to allow time for the intervening valley of three to four miles in width, to be eroded to a depth of 250 ft., if this gravel has been derived from the south.

I would refrain from theorising upon the apparent absence of other rocks than flint in this particular section until this is further confirmed, but the brown-stained subangular flints and implements certainly seem to point to the southern origin of this gravel.

I am glad to know that Mr. Hogg, to whom I mentioned this section whilst the works were in progress, has independently examined the gravel, and found worked flints which corroborate the finds I have myself obtained.

4.—The Gravels of South Norwood Hill.

By A. J. Hogg.

(Read May 19th, 1903.)

The cutting on South Norwood Hill described by Mr. Robarts, so interesting from the discovery of eolithic flint-implements in an unexpected locality, was also remarkable for the succession of beds which it revealed as the hill was ascended.

I had the advantage of being able to watch the progress of the work from day to day, and noted the successive sections as they appeared, commencing at a height of about 340 feet O.D., and continuing to the top of the hill.

The beds cut through differed in every few yards, and the sections recorded are only some examples of the many changes in the series of deposits.

It will be noticed that at the time when the road was made, the upper part of the hill was a peat-covered heath.

Sections from "Holmwood" (No. 260) to near St. Saviour's Church.

	ft.	in.
I.—Peaty gravel	2	0
Grey sandy gravel	3	0
II.—London Clay, extending 9 feet only	5	0
III.—Peaty gravel	2	0
Grey sandy gravel	3	0
IV.—Peaty gravel	2	0
Grey gravel	2	0
Ochreous clay	1	0
V.—Peaty gravel	3	0
Grey gravel	2	0
VI.—Peaty gravel	1	0
London Clay	4	0
VII.—Peat with bracken-roots	2	0
Coarse ochreous gravel	2	6
VIII.—Peat with bracken-roots	1	6
London Clay	3	0
Grey gravel	4	6

The peaty gravel was pebbly and sandy, and contained no implements.

The grey gravel was either clayey or sandy in different sections, and consisted of angular and subangular flints, a number of which were of a deep ochreous tint, and comprised a good many rude eolithic implements resembling those of the Chalk plateau found by Mr. Harrison and others.

This was evidently a drift-gravel, perhaps from the north or north-west, composed of the *débris* of some of the Older Tertiaries, and containing many irregularly-shaped fragments of flint, so white as to be easily mistaken for chalk. No chert, ragstone, or ironstone was observable; and I did not see any chalk in the sections which I examined.

The ochreous gravel was much coarser, contained many large pebbles, and differed entirely in appearance from the grey gravel. I found in it only two implements of plateau-type, and no implements of later date were found in either gravel. All the implements are much abraded.

5.—Flints found at Waddon Marsh.

By Harry D. Gower.

(Read Tuesday, May 19th, 1903.)

When Mr. Clinch, the Honorary Secretary of the Anthropological Section of the Society, intimated to me that the few flints (Fig. 1, Plate) I had discovered, with one or two very small pieces of pottery, at Waddon Marsh, were of considerable importance, and suggested that I should exhibit the objects, and read a short note of the find, at our monthly meeting, I felt at the moment, and do now, that he, being well versed in the matter, could make a much more presentable record of the subject than myself, and to whom also I must tender my thanks for a note upon the small pieces of pottery found in September, 1902.

But, to be brief, I will give you, in as few words as possible, the facts of this small find.

Last year, when the Waddon caves were discovered, I may perhaps not be wrong in stating that some amount of disappointment was felt from the lack of interesting material they yielded; certainly we got pieces of pottery, and also flints showing use, and also other traces; but apart from this, nothing in the way of those nicely chipped flints and arrow-heads and finished weapons one might expect to find in or around caves of this sort; and the question may naturally arise, Have these caves ever, at some later period, been disturbed?

This is a question I am not prepared to discuss, but, the fact of this question crossing my mind, I made a careful examination of some earth at Waddon Marsh that was being excavated and carted away, with the result of finding a carefully-worked lance-head, as shown upon the table this evening; the finding of this implement gave me fresh energy, with the result of further finds, which are also shown. I might mention, that a good many of the flints have not been found without some amount of labour, and also with the kindly help of several of our members in sifting and examining the soil, which is about 18 to 24 in. thick, before we come to the gravel, or, might I say, neolithic floor? Also amongst it, some few small pieces of pottery were also found, a piece of which I submitted to Mr. G. Clinch, and he kindly reported to me as follows:—

"*Note on Pottery found at Waddon Marsh, in September*, 1902.

"I have carefully examined, with the aid of the microscope, the fragments of pottery found at Waddon Marsh, and find that the

FIG. 1.—ARROW-HEAD AND FLAKES, WADDON MARSH, CROYDON.

To face p. 20.

small white grains in it are fragments of calcined flint. As many of the other fragments of flint in the pottery show but

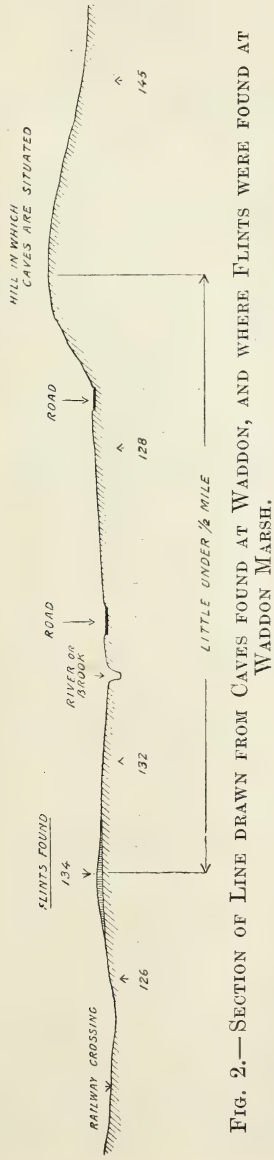

FIG. 2.—SECTION OF LINE DRAWN FROM CAVES FOUND AT WADDON, AND WHERE FLINTS WERE FOUND AT WADDON MARSH.

few, if any, traces of fire, and are not at all reduced to a calcined condition, it is clear that the flint was first burnt and broken into small fragments before being mixed with the clay, of which the vessel was mainly formed; the whole was then burnt to a brownish tint.

"I think there can be little, if any, doubt that the pottery is of a pre-Roman date; and I think it probable that it was made in the pre-historic age of iron.—Signed, George Clinch."

The situation of the ground would not, perhaps, at the present period, give much idea as to what it was like in years gone by; but from the Waddon caves we have a gentle downward slope in a northerly direction to the present brook or Wandle stream, and past the brook the ground eventually rises somewhat, making a very natural shallow depression, and, after heavy rains, gives the surrounding meadows a marshy aspect; but the present drainage soon getting rid of the water, and, as we should expect from such a situation as this, with a stream running between the two contours and the absence of any drainage, would certainly make the ground around, in a short time, very swampy. The caves being situated upon the south side of the stream, the present flints being found upon the north side, and in the south-east corner of the ground upon which the Croydon Gasworks are situated.

I had hoped, before reading these notes, to have been able to investigate further; the ground is not in a very good condition for sifting, and it is really only by this method, and careful examination, that one can find anything interesting and of value; but I do think it points to one thing, and that is, coupled with the recent finding of the caves, and traces of flints and pottery which I have mentioned to you this evening, that a careful examination of the soil, where possible, around and in the immediate vicinity or neighbourhood, will give us some interesting facts, and are worth more than a passing notice.

You will notice a good many of the flints, and also flakes, show the bulb of concussion very plainly, and in several cases worked at the edges, and probably used for a variety of purposes, most noticeable, perhaps, being a scraper with a round worked edge; others might be only large chips, and fragments chipped off during the process of manufacturing more finished implements, and of which up to the present time I have singularly failed to find many specimens.

The lance or arrow-head is, I believe, a somewhat uncommon form, and not frequently met with; but it will be noticed it is very carefully worked, and leaves little doubt as to the purpose it was intended for; the other two flakes in the same box may be flakes, but they show some working, but are of an entirely different shape.

Here is upon the table a flint which to all appearance has been partly manufactured into an arrow-head, but probably discarded from an accident in flaking or working, and has been cast on one side; also other flints, which one might almost assume were in process of manufacture.

Many of the flints, that would most likely be passed by a casual observer, are worthy of careful examination, for it will be seen a good many possess a business edge, and probable wear from use.

A small flint used for hammering, showing the small fractures, which is a well-known sign of what it has been used for, is amongst the larger flints shown; and since I have made the previous notes a small piece of hard sandstone, which is very much worn, has come to light. It is somewhat oval in form, and has the appearance of having been used on one side, a groove in the centre being polished, and is certainly curious.

With this I must not detain you longer, but I am in hopes that, as the ground gets more broken up in the immediate neighbourhood of the Waddon Marsh, other examples may be found, which may supplement the present small collection before you this evening.

6.—The Parallel Roads of Glen Roy.

By Dr. T. Archibald Dukes, B.Sc.

(Read October 20th, 1903.)

What are these "Parallel Roads" of Glen Roy? They are not highways for traffic; nor even footpaths. They are just terraces or ledges making lines along the mountain-sides. Of course, there often are ledges or shelves upon mountains; but these are unusual, extraordinary, even strikingly so. They run for miles and miles right up to the very ends of the valley; they run into all the branches and arms of the valley; they are quite horizontal; there are three of them, one above the other; and they are upon both sides of the valley.

The causation of these curious terraces, or Roads of Lochaber, as they were called, has attracted the interest of most of the geologists of the last century. Since, however, the various theories of their causation appear to be mutually destructive, I have ventured to suggest another cause which seems simple and natural.

First, let us see where Glen Roy is. Half-way down the west coast of Scotland is the Firth of Lorne, which runs up north-east into Loch Linnhe, and this in the same direction to Fort William. Just east of Fort William is Ben Nevis, and ten miles north-east of Ben Nevis is this Glen Roy, which also runs up north-east for some ten miles or so.

Fig. 1.—A sketch-map of Scotland, showing how the south-west wind is caught by the Firth of Lorne and conducted up Loch Linnhe to Ben Nevis, beyond which Glen Roy is indicated.

It is a steep narrow valley about a mile broad, between mountains over 2000 ft. high, and has a noisy burn running along the bottom. Starting up this glen, you first notice a branch valley on the left—Glen Collarig—which curves round and rejoins Glen Roy higher up, thus helping to isolate the Bohuntine Hill, which

stands west of the entrance to Glen Roy. The public path up Glen Roy runs along the side of this Bohuntine Hill, until you get a good view up the glen and see the three "parallel roads."

There they are at a much higher level than yourself on every mountain-side, running into every recess, and everywhere parallel, while yet following every sinuosity of the mountain-sides. Now let us climb up this Bohuntine Hill, and see what they look like from there. The side is steep; the soil is soft, easily breaking

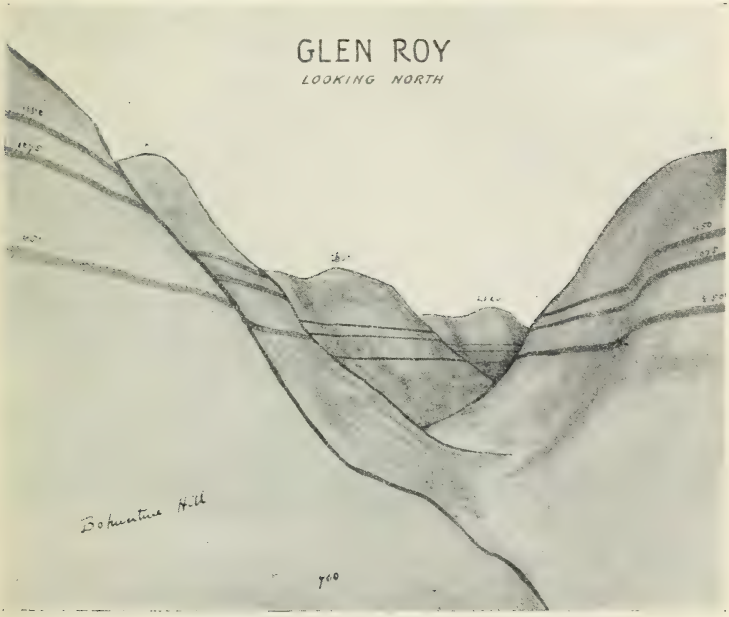

Fig. 2.—A sketch-view looking up Glen Roy, showing the general appearance of the "parallel roads" upon the hill-sides as seen from the much lower level of the public path running up the glen.

away, and consists, under a few inches of peat, of a gritty clay full of angular stones of all sizes from your fist downwards, though there are some boulders larger than your head; no shells; no fossils. It is very likely soaking with moisture, and barely held together by the heather and grass with ferns and mosses which are growing on it. Now, although these "roads" are strikingly distinct when seen from a distance with a favourable light, you will be surprised to find how vague and inconspicuous they are when you are actually on them; in fact, it is quite easy to walk right over a "road" without noticing it, and then, on

looking back, to be doubtful where it is. Let us then go up to the middle or second "road." It is by no means obvious to look at; it is just a slight alteration of the general inclination of the mountain-side, such as frequently occurs where any depth of soft soil lies on a slope. This forms a terrace or landing, rather more level than the hill-side, which again is extra steep just above and below it. This terrace makes a strip from 20 to 60 ft. broad, with rather more grass growing on it, between two narrower strips with rather more heather than usual. It is quite easy to doubt if any one spot is really part of the road, until you look wide and abroad; then the effect is indeed remarkable. It is

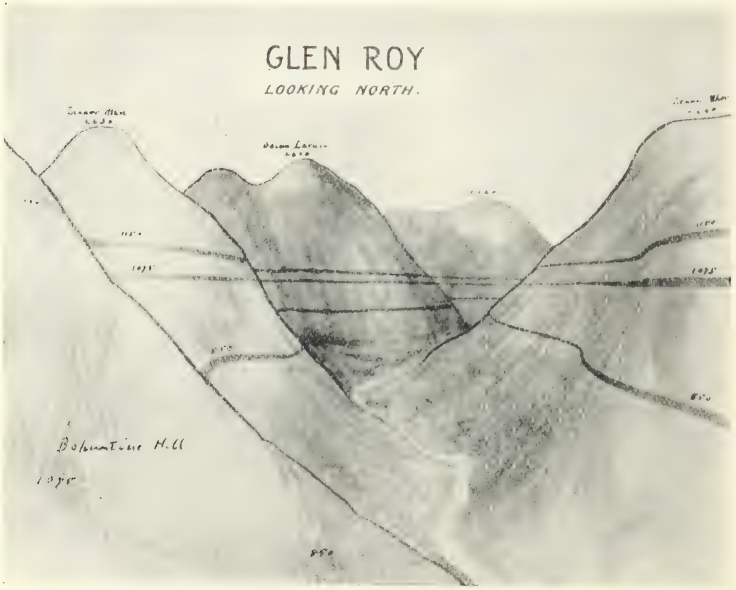

Fig. 3.—A sketch-view looking up Glen Roy as seen when standing on the middle "road," showing how in that position the middle "road" appears everywhere in one straight horizontal line.

just like when a diver raises his head above the surface, and sees the shore all round him—everywhere in one straight horizontal line.

You may get some idea of this effect from the above view, in which the second "road" is drawn in one straight line from hill to hill; in fact, a piece of stretched string held before the eye can be made to eclipse that middle "road" all along. This is equally true of the upper and lower "roads" when you are

standing at their respective levels. The "roads" above and below where you happen to be standing of course appear curved by perspective, and can be seen winding round the hill-sides. It has been proved that each "road" is accurately horizontal; so much so that the road in the far distance distinctly dips below the horizontal level, just as a water surface does, owing to the earth's curvature. It is probably because the eye instinctively recognizes this curvature that the impression of a lake-shore is so irresistible.

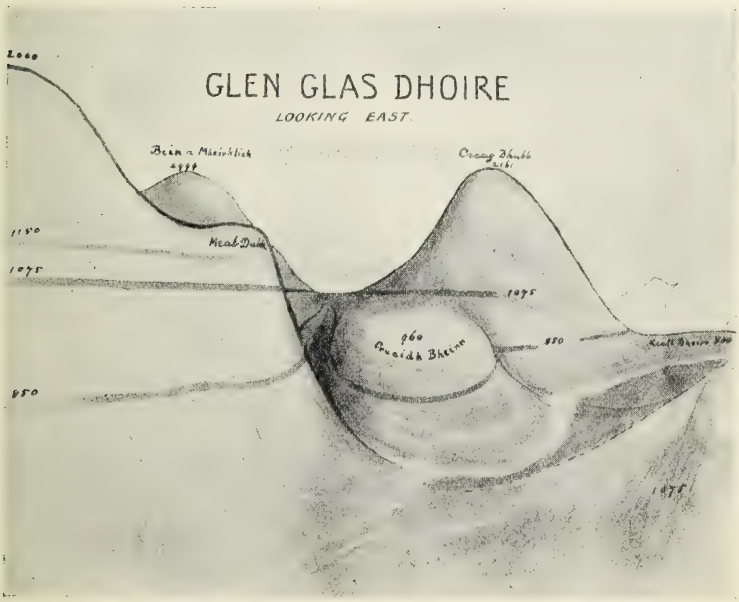

Fig. 4.—A sketch view from Bohuntine Hill, at the level of the middle "road," showing how the different "roads" variously end upon the other side of the glen.

That was looking north. Now, from near the same spot take another view, looking east, of the "roads" on the other side of the glen. Here you see a branch valley—Glen Glas Dhoire—cutting off a big hill—Creag Dhubh—from the eastern mountain wall of the Glen Roy Valley; and looking up that Glen Glas Dhoire Valley, you see it ends in a broad flat "col" (mountain pass or valley watershed). Now note how accurately that "col" corresponds with the level of the middle "road." The impression of a lake overflowing there is insistent, almost irresistible. (In

the same way the upper parallel "road," height about 1150 ft., corresponds to the level of a "col" at the top or far end of the Glen Roy Valley, height 1151 ft.) Again, note that the upper parallel "road" terminates above (*i. e.* north of) the Glen Glas Dhoire entrance. The second "road," after running up towards the "col," is continued beyond on to the side of the big hill—Creag Dhubh—and ends there; while the lowest "road" runs right away round the Creag Dhubh Hill into the main Spean Valley, of which this Glen Roy is a mere tributary.

Fig. 5.—A reduced Ordnance Survey map of the district. Mountains shaded according to elevation, but heights over 3000 ft. are lighter, as though snow-capped. Ben Nevis and his range are seen running east from the top of Loch Linnhe. The Spean Valley, near the centre of the map, runs parallel and to the north of this range. Glen Roy is a branch valley on the north side of the Spean.

In this Glen Spean no traces of the upper two parallel "roads" are anywhere found, but the lowest "road" is, at intervals, repeatedly indicated, either by faint lines or big terraces on its boundary mountains, and always at this level of 850 ft.; so that, as we travel along the coach-road up this valley, we gradually mount up towards the same level, and several times before we reach Loch Laggan find ourselves actually on a broad terrace at this same level. Here, looking across the valley towards where the river Gulbin joins the Spean, we see what looks for all the

world like a huge railway embankment, with a level top as high as the roof of a house which is built under its lee. This really is the side view of a huge terrace or platform half a mile across, with its upper surface a few feet below this same (850 ft.) level. In one place sand is being dug from it. Proceeding eastward, while passing Loch Laggan, the coach-road is generally on a terrace at this same 850 ft. level; and at the head of the valley the "col" at Makoul is at the same height (850 ft.) as this lowermost parallel "road," which we have traced all the way from Glen Roy up the Spean Valley; so you see the level of each "road" corresponds to that of a "col" into which it runs.

Now what was the cause of these parallel "roads"? How came they there? That is the question which makes them so interesting. Are they raised sea-beaches? Well, consider that there are hundreds of similar glens all round about. Remember how distinctly the "roads" are marked in Glen Roy, and that no trace of them appears anywhere else.

There is, however, just one other parallel road, and this is found in the next-door valley, Glen Gloy; and there, though this fourth "road" occurs on the other side of the same mountains, though it approaches within a few hundred yards of our highest Glen Roy "road," yet it is at a level which is distinctly higher than this "road," but corresponds instead to the level of the "col" at the head of its own valley. Could the sea have made this fourth parallel "road" in Glen Gloy, and yet make no trace of a parallel "road" at this level in Glen Roy? Or can you believe that the sea was standing for a long time at the lower levels of the Glen Roy "roads," and made no corresponding marks in Glen Gloy? Or, more incredible still, can you believe that the sea could have stood at these four different levels, and yet left no other traces in the hundreds of similar valleys all over the country? No alteration of sea-level can explain why parallel "roads" were formed just here and nowhere else.

Then again, since in every instance the "road" corresponds to the level of its particular "col," the conclusion is natural that that "col" was concerned in the formation of that "road." Why should the ocean choose to stand still always just at the level of a "col"? No! These "roads" are distinctly local and peculiar, and require an explanation that is also local and peculiar; and this is ready to hand. If the lower half of Glen Roy were to be blocked up, obviously the rain and water would accumulate in the upper part until it gently overflowed at the lowest available level; this is the "col" at the top of the glen communicating with Strath Spey, and the water would remain at that level as a lake, which would wash a shore or beach out of the soft steep bank round its edge. Thus the highest parallel "road" is made. Now let the obstruction which we suppose blocked

up Glen Roy be moved lower down the valley. When it gets past Glen Glas Dhoire, obviously the water will rush up that glen and flow over its "col," which is at a lower level than that of the old lake in Glen Roy, until the lake settles to the level of this second "col." Thus the second parallel "road" is formed. Now move the obstruction lower down, and old Loch Roy runs directly into the Spean Valley; but if we suppose the mouth of this Spean Valley to be itself blocked up, the waters of the glen, dammed back to form a huge lake, would again overflow at the lowest available spot. This is the "col" which we have seen at Makoul in the far end of the valley beyond Loch Laggan; so at this level, 850 ft., the lowest "road" is formed in both Glen Roy and Glen Spean.

What could have formed this slowly moveable obstruction? An obstruction which has now completely gone, and left not a trace behind? Ice, certainly. And there is abundant evidence of ice action in the Spean Valley—moraines, scratches, and striæ; while, in places, obstructing rocks of hard schist are rounded off and smoothed down by the grinding glaciers which flowed over them. And there, opposite the mouth of Glen Roy, stands the highest mountain in the kingdom—Ben Nevis—with his neighbours Aonach Beg and Stob Coire an Easan, which are supposed to supply the required glacier. I believe, however, no one has ventured to draw upon a map the position and course of a glacier thus obstructing the glens. The configuration of the hills makes it mechanically impossible that any glacier should take such a course, for when it has reached the bottom of the Spean Valley, consider the forces acting upon it. From Glen Roy there comes a pressure of a mass of water, 850 ft. high, forcing the glacier towards the west. There is nothing to prevent the glacier going in that direction downhill some 200 ft. to the river Lochy, four or five miles off. But instead of taking this widely open unobstructed passage to the sea, we are asked to believe that it turns eastward, and, in the face of that enormous pressure, runs uphill more than 200 ft. for some four miles into a steep narrow valley. There is no moraine nor other sign of the former existence of such a glacier, and Glen Gloy, which is a branch of the Lochy Valley, would require another glacier to block its entrance; and to this there are further objections.

All these difficulties disappear, however, if we remember that ice is not always liquid, it is sometimes solid; it is not always a flowing glacier, it is sometimes a stationary mass. How it came about was, I imagine, something like this:—During the Glacial Epoch Scotland was covered deep with ice, because year by year more snow fell than got melted. This accumulated till it flowed off the mountains as glaciers, filled up the valleys, and perhaps covered up the tops of the mountains in one uniform snow-field,

or ice-cap, so deep that its weight squeezed icebergs out of the valleys into the sea as fast as the snowfall accumulated upon its surface. Then slowly the Ice-age began to abate; it got warmer, and more snow was melted in summer-time than formerly. That does not mean that the ice-cap began to get thinner all over, for the rainfall and snowfall is much greater in the west than towards the east—*e. g.* at one end of the Caledonian Canal the rainfall is well over 100 in., at the other end it is only 25 in. per annum; hence, clearly, while the yearly thaw was between those amounts, in the one place the ice and snow would be melting right away, while in the other, though just as much thawed each year, the ice-cap would be kept at its full thickness by the excess of snowfall upon it.

The prevailing south-west wind is the chief rain-bearing wind; this wind, after skirting the North of Ireland, is caught by the Firth of Lorne and conducted by Loch Linnhe to Ben Nevis; hence the snowfall there would be very great. Even nowadays the annual rainfall is as much as 80 in. at Fort William, 100 in. on the hills, and 120 in. in Glen Coe, and as much as 145 in. on Ben Nevis, while in Glen Roy it is only 40 in., and 46 in. at L. Laggan. In the Ice-age the precipitation on Ben Nevis was even greater, but the chief difference then was that much of the rain which now falls on the south-west slopes of the mountain was then, as snow, blown over Ben Nevis and drifted into the Spean Valley under its lee, while at Glen Roy and Laggan the rainfall was less than at present; hence for a long time after the ice and snow was melted away from the upper end of the Spean Valley, from Glen Roy, Glen Gloy, and beyond, the last remnant of the glacial ice-cap, sheltered behind Ben Nevis, remained unimpaired in the mouth of the Spean Valley.

I have marked on the contour map of the district the position which, I suppose, this huge snow-drift once occupied. (Fig. 6.)

It will be seen this ice-mass blocks up the mouths of Glens Gloy, Roy, Glas Dhoire, and Spean, so as to dam back lakes in them, each overflowing at its "col" at the far end of the glen. This state of things had existed for a long time before the ice-mass had shrunken to this size, and so the highest roads were formed. Now, although the warmth of the sun and air had been insufficient to melt this obstruction, it is clear that the waters of the lakes would have more effect, for they gather warmth all along their valleys, and expend it in melting the ice-block where they touch it. So each of the lakes is drawn with its corresponding gulf hollowed out of the ice. This gulf, in the case of Glen Gloy, for instance, will go on extending and undermining till it reaches the second position drawn on the map. A little more of this action, when it has reached the second ice-margin drawn in the map and shaded diagonally, and Lake

Gloy undermines the ice-mass, eats its way through to freedom, and empties its waters in a northern direction into Loch Lochy. *Note.*—To this day the River Gloy turns north at this point and runs into Loch Lochy, instead of continuing its course south-west in the direction of the valley.

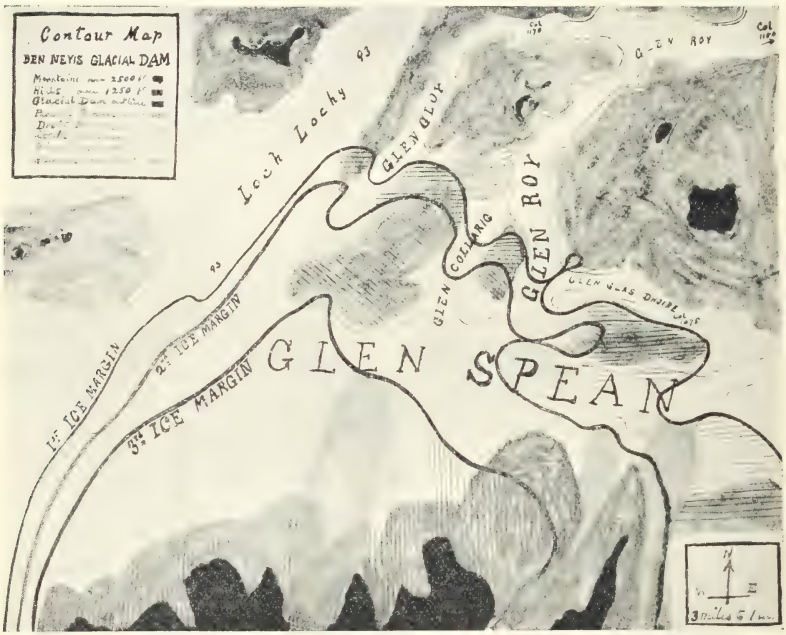

Fig. 6.—Map showing the successive positions of the shrinking ice-dam which blocked up the valleys, so making lakes, the shores of which are the parallel "roads." Hills over 1250 ft. shaded lightly. Mountains over 2500 ft. are black. The lower edge of the map shows the northern slopes of Ben Nevis and his big neighbours, with peaks ranging from 4400 to 3500 ft. high. In other parts a few peaks reach 2500 ft. The parallel "roads" are seen as thin lines bordering the valleys. The margin of the ice is indicated by a thick wavy line, and is shaded horizontally, diagonally, and vertically in the first, second, and third positions respectively.

In the same way the lakes in Glen Roy and Glen Glas Dhoire eat their way into the icy dam till they reach the position drawn as the first ice-margin. A little more of this undermining, and these two lakes finally intercommunicate sideways, deep down under the ice, by a hole which would at first be small, but, since the greater pressure on the Roy side of that hole corresponds to a column of water 85 ft. high, it would be rapidly enlarged. The

soft soil and stones would be washed away and carried into Glen Glas Dhoire. Thus, while the waters of Roy rush up that glen, the tongue of land between the two lakes would be steeply and abruptly cut off, and the materials washed away and packed into the convenient gulf hollowed out of the dam by the Glas Dhoire Lake. We may see that this has happened. The sketch of Glen Glas Dhoire shows Meal Dubh steeply cut off; while just opposite, at a level a little below the second "road," is the big rounded bank, Cruaidh Bheinn, whose size, shape, height, and position show that it remains as a cast of the gulf which existed there at the time of the *débâcle*. The stones in this drift-bank are water-worn, which is very unusual in these valleys. (Fig. 4.)

After the waters of Glen Roy had thus overflowed through Glen Glas Dhoire and settled to the level of the middle "road," the united lake would continue to eat its way into the ice-dam. At the same time the lake in the upper part of Glean Spean would similarly continue to hollow out its gulf for another three or four miles. Then in the position of the second ice-margin drawn in the map the two lakes would communicate over the shoulder of Creag Dubh, and again form a drift-bank in the end of the advancing Spean gulf, which remains to-day as Meall Dhoire, a big bank, height 800 ft., on the east side of the entrance to Glen Roy. Thus the water in the glens sinks to the 850 ft. level, and there forms the lowest "road" round its edge.

But at this time there must be a small lake left in the upper part of Glen Collarig, for it communicates with Glen Roy as yet only by its "col," height about 950 ft. Until its gulf joins the advancing Spean gulf, this little lake ought to be forming a less marked "road" at that level. I am not aware if that road in Glen Collarig does exist, but expect it does, since opposite Glen Collarig there is a mound, height 800 ft., due north of Roy Bridge, which I take to be the drift-bank formed when this Collarig lake emptied itself into the Spean. Anyhow, the enlarged Spean lake would continue to advance into the diminishing glacial dam until it reaches the position of the third ice-margin drawn, and shaded vertically, where the ice is seen hugging the mountain, and sheltered under its northern slopes, while still stretching across to the other side of the valley. Then what probably happened was that the dammed-up waters found, or melted, a channel or crevice under the ice, and emptied all the waters of this huge lake, thirty miles long, and at this place 600 ft. deep, by this subglacial channel.

When such a large body of water at such tremendous pressure was discharged through a narrow passage at one place, it would naturally make some permanent mark on the locality. And there is here a striking phenomenon. The small river Spean, in its meandering course through a broad flat valley, at this point runs

through a jagged rocky gorge, which makes a magnificent sight from the railway above Spean Bridge. How could that small stream have exerted such extraordinary power at this point to break up and destroy its rocky bed? Probably this gorge was cut by the escape of the waters of Loch Spean under the Ben Nevis glacial snow-drift. The river from that point still skirts the position that that snow-drift then occupied, instead of running straight across to Fort William.

This snow-drift ice-block theory seems to explain all the details of the parallel "roads." The upper "road" comes down to the margin of the ice, in the first stage drawn, and no further. The middle "road" reaches the retiring edge of the block, as drawn in the second position. And both these "roads" wind into the upper part of Glen Collarig, and stop at the place where the ice stood in that glen then. The lowest "road" occurs everywhere above the last boundary of the obstructing dam. It does not wind into the upper end of Glen Collarig from Glen Roy, for that is at too high a level, but it runs up the lower half of Glen Collarig from Glen Spean. Also this "road" is marked less clearly in the lower part of Glen Spean, into which the lake had not long advanced; while in the upper part of Glen Spean, where the lake must have existed much longer (from the very beginning of the upper "road"), there the water-level is represented by very broad stony terraces, and by the big delta which the River Gulbin formed when Lake Spean flowed eastwards.

Thus, merely assuming that the Glacial Epoch only very slowly passed away, this simple and natural theory completely and accurately accounts for the exact position and extent of all the parallel "roads," points out evidence of the successive *débâcles* by which the lakes were lowered, and explains it all as the natural result of the physical conditions at present existing.

7.—Jade or Nephrite.

By H. C. Collyer.

(Read December 15th, 1903.)

The subject of the paper this evening is one which was for a long time involved in a considerable amount of mystery, which has even now not been entirely cleared up. Jade and its kindred minerals have been found in use in several parts of the world where the stone itself is not known to exist; for instance, at the

discovery of America the natives of Mexico had ornaments and amulets of green jade, which material has not been found in its natural state on the American Continent, the only exception being two small boulders found in the bed of the Frazer River, British Columbia, which may have been brought there by human agency, as one had been partly cut, as noted later on, the nearest known source being eastern Asia. On this has been founded the theory that at some time there has been communication between Asia and the western coast of North America. The jade of Mexico was very rare, and the subject of many superstitious beliefs.

Again, in Western Europe, especially in Brittany, axes of jade and jadeite occur which were supposed at one time to have been brought from Asia, none of the natural jade being found in Brittany; but of late years there have been isolated finds of jadeite of a somewhat similar character in the Alps and in Silesia, so in any case it was probably brought from a long distance.

Jadeite differs from true jade in having a larger proportion of alumina in its composition; it is harder and more opaque.

The most notable characteristic of the various forms of jade is its extreme toughness; it can only be broken or splintered by using very great force, but is not too hard to be worked into shape by laboriously rubbing it on a rough stone or with wet sand.

Primitive man seems to have had a keen eye for the hardest stone to be obtained, and from the stones in river-beds he picked out the rare pebbles of jadeite in preference to all others. In the Swiss lake-dwellings the jadeite axes found are of a peculiar variety called "saussurite," which occurs in pebbles in the valley of the Rhone, and was found *in situ* in the Alps by De Saussure, hence the name.

On the table are two specimens of "saussurite" axes from Switzerland, and a number of jadeite axes from Brittany; the latter show every sign of the value placed on them in the careful way they are finished. One has the commencement of a drill-hole at the top, as if the owner began to bore a hole in it for suspension, and found it too tough a job. The material was evidently scarce and highly prized, for the jadeite axes are very rare, and are found buried with their owners as evidently valuable possessions.

The Brittany celts shown are all of jadeite except two, one of them being of fibrolite, which looks like jade, but is a simple silicate of aluminium; the other and larger one is made of chloromelanite, which is also a silicate of aluminium, but with a proportion of iron; it is much heavier than any of the others, having a higher specific gravity.

A dark green jade, and also a variety of it called oceanic jade, are found in New Zealand, New Guinea, and New Caledonia. The Maoris of New Zealand place a high value on it. A weapon peculiar to the chiefs, called a "Mere," was sometimes made of this material, and was then priceless; one was given by the Maoris to the Prince of Wales on his visit to New Zealand two years ago, as the most valuable thing they had.

Green jade was also made up into pendants for the ears, charms in the form of axes, and especially into certain charms called "Tikis," or "Hei Tikis," which are in the form of a little squat figure with eyes of haliotus-shell, and a wide open mouth showing his tongue. An old specimen of a "Tiki" is now very valuable, and can with difficulty be obtained, as the Maoris are buying back all they can, and none are allowed to leave New Zealand.

On the table are some green jade axes, charms, and ear-pendants from New Zealand, and also a "Mere" of diorite, to show what a "Mere" is; it was used for thrusting, not for striking.

But China is the country in which jade is most highly valued; it is considered to bring good luck, hence all who can afford it wear a piece about their persons, either in the form of an ornament for the dress, or a charm-pendant, either carved or a crude natural piece. The Chinese name for jade is "Yu." They regard it with the most superstitious reverence, and expend an immense amount of labour in carving it elaborately when they get a good piece to work on. It is such an intractable material that years are expended in some of the more elaborate carving.

The specimens shown include a finely carved cup lent by Dr. Hobson. Also a green jade incense-burner, an exquisite charm or dress-fastener, cups, and a sceptre; all from Mr. Epps's collection. There is also another sceptre from my own collection.

These sceptres are called "Joo-ee," and formerly used to be given by the emperor to the governor of a State on his appointment, as an emblem of authority. Some are made entirely of jade, but the majority are of wood, with pieces of jade affixed, as are the specimens before you. In my own specimen, the cement fixing them on had perished with age, and on fastening them on again I found that the top piece of jade is hollowed out with great care to make it lighter, and as the bottom piece is solid the sceptre balances well in the hand. The peculiar form seems to show that in its origin the "Joo-ee" was a flower with a long stalk, in all probability a lotus lily, as the earlier jade specimens are all carved with the lotus, and the others have trees or flowers on them.

Among the other specimens from my own collection are an ointment-box in the form of an interrupted ring—this is a very rare and curious piece; several carved cups, one of rounded form,

so cleverly made that it will only stand upright, and cannot be upset. A green jade cup and saucer have the monogram of the Emperor Kien Lung, dating about 1740 A.D. There are several dress-fasteners and ornaments and some charms, some of them finely carved. One has characters on it meaning "good luck," "prosperity," and "long life," and is in the shape of a Chinese coin. An unfinished spill-box has the interior only just roughly worked out, and shows how the Chinese bore out some of the specimens. A copper cylinder has been made to rotate quickly with wet sand in the hollow. This leaves a core which is broken off; the stump of the core can be seen. Most of these specimens have been brought from Pekin recently.

Chinese jade varies in colour from dark green to light apple-green, greenish grey, grey and white. New Zealand jade is dark green and semi-transparent.

There has been great confusion between jade, jadeite, and similar minerals; but some years ago a French chemist, M. Damour, published analyses which set the matter at rest. The analysis of white Oriental jade from China is given as follows:—

	Per cent.
Silica	57·60
Magnesia	25·61
Ferrous oxide	00·66
Lime	12·68
Alumina	00·25
Water, &c.	2·74
	99·54

Specific gravity, 2·97 per cent.

Green jade from New Zealand; analysis as follows:—

	Per cent.
Silica	51·70
Magnesia	23·50
Ferrous oxide	7·62
Lime	13·09
Alumina	00·65
Water, &c.	2·42
	98·99

Specific gravity, 3·015 per cent.

Thus containing less silica and magnesia than Chinese jade, but a considerable amount of ferrous oxide, to which its colour is due.

Jadeite, as distinguished from true jade, contains a large

amount of alumina and soda, which take the place of magnesia and lime in the true jade, as the following analysis of a jadeite celt from Brittany will show:—

Analysis of Jadeite Celt from Brittany.

	Per cent.
Silica	58·62
Magnesia	2·23
Ferrous oxide	1·86
Lime	3·85
Soda	11·64
Alumina	21·77
	99·97

Specific gravity, 3·344 per cent.

"Saussurite," the form of jadeite from which many of the celts from the Swiss lake-dwellings are made, contains a much larger percentage of lime than other jadeite, but less soda.

Specific gravity is the simplest test by which to distinguish jade from jadeite; the latter being much heavier. And, again, jasper, which sometimes resembles green jade, is a great deal lighter, having only a specific gravity of 2·6.

In New Zealand is found a green mineral resembling jade, but more transparent, softer, and having a laminated structure, which is a green variety of hornblende. Imitation Maori pendants are made of it, and passed as jade. One or two specimens are shown, and a piece of the crude mineral; also a piece of crude green jade.

When jade was first brought to Europe by the Spaniards, it was believed to be a specific against disease of the kidneys, and was called by them "Piedra di Hijada," or kidney-stone; thus the origin of the name jade, and nephrite also means the same thing.

Chinese jade is found among the mountains of Western China, in the province of Yunan, but the Chinese obtain their larger supply from Central Asia, from quarries in Turkestan, Yarkand, and Khotan, which have been worked for about two thousand years. Jade is also found in Burmah and in Siberia.

Axes of jadeite and jade occur very frequently on the Pacific coast of North America. But the only pieces in its natural state yet found have been two small boulders in the Frazer River; and one of these had been partly sawn into shape by means of a thong of leather worked to and fro in wet sand. The stone had been worked from opposite sides, and when the cuts were sufficiently deep, the medial ridge was broken.

Dr. Schliemann found at Hissarlik, the site of Troy, in the

lowest prehistoric stratum, a number of axes of jade and jadeite, which are supposed to have been made of material brought from Central Asia. Although the theories of tribal migrations founded on the occurrence of jade far away from its source of origin may be far-fetched and hypothetical, there can be no doubt that in the earliest times objects of value travelled long distances from hand to hand by means of barter. Witness the constant occurrence of amber from the Baltic on prehistoric sites in Southern Europe, and of turquoise from the east in the dolmens of Brittany. It may therefore be fairly inferred that jade axes, being of great value from their rarity and toughness, and esteemed for the properties attributed to the material, were used as articles of barter, and passed from one tribe to another over large tracts of country.

Jade is said to be softer and easier to work when first quarried, and hardens by exposure. But the Chinese prefer water-worn boulders for important work, as, although much harder, they are less liable to unsuspected flaws, as such flaws, had they existed, would long ago have caused fractures from the knocking about the pieces received in the river.

The Emperors of China claimed all jade found, and in the case of an exceptionally fine piece a committee of artists was called to decide as to the most suitable form to cut it into, the work frequently taking many years. The first occasion on which Chinese jade appeared in Europe in any quantity was after the sack of the Summer Palace in 1860, when quantities of fine specimens were brought here, and more especially to France; also since the recent occupation of Pekin by European troops a great deal has been brought over. It is therefore to be feared that nearly all the fine old specimens of jade in European collections have been looted from their owners. Apart from the proceeds of warlike expeditions, old carved specimens of Chinese jade are difficult to obtain, and very expensive.

It may be of interest to inquire as to the origin of the esteem and superstition with which jade is regarded wherever it is known and used. We have seen that alike in China, New Zealand, Mexico, and prehistoric Europe it has been looked upon as possessing magical properties, and highly valued accordingly. May it not be that, as jade was the toughest material known to primitive man that was suitable for weapons and tools, before he became acquainted with the use of metals, it became always associated with the idea of power and authority, as only those of high rank could afford to possess it on account of its rarity? In proof of this, there is a beautifully made green jade axe found in the Imperial Palace at Pekin, which was evidently regarded as an amulet of value. Also the necklaces worn as collars of office by mandarins have small axes mounted in gold hanging from

them, the number denoting the rank of the wearer. The one shown from my own collection has four such—two of jade, one of amythyst, and one of glass imitating saphhire. There is a vacant place for another to be added when the wearer rose in rank. There is also an imitation of a New Zealand "Tiki," but smaller—this is from Pekin, thus being a Chinese adoption of a New Zealand superstition; and a Persian charm of greyish jade with a long inscription; also three Chinese discoidal charms, one of them with characters, another plain, and the third of pure white jade, very finely carved. A water-worn lump of white jade is in its natural state, as found in a river-bed.

I was recently shown a large piece of New Zealand jade which its owner had received in its natural state, but afterwards had it cut and polished, and the workman said he did not wish to do any more jade-cutting, as being so tough it tore his wheels all to pieces.

The principal authorities on the subject of nephrite in this country are Mr. F. W. Rudler, F.G.S., and Mr. J. Hilton, F.S.A. Various papers and notes by both these gentlemen have appeared at various times in the Journal of the Archæological Institute, and the Journal of the Anthropological Institute of Great Britain, from which many of the foregoing facts have been collated. Dr. A. B. Meyer, the Director of Museums at Berlin, is issuing in parts a most exhaustive work on nephrite, "Zur Nephritfrage." The part issued this year describes the jade axes used by the natives of New Guinea, which are true oceanic jade; and also gives an account of the finding of a large and remarkable block of jade found in a quarry at Jordansmühl, in Silesia. This block, weighing 2140 kilos, was an erratic boulder, borne from a long distance by glacial action, and of fine quality. It is estimated to exceed in weight all the jade and jadeite axes found, and in public and private collections in Europe. He also gives a full list of all the papers, books, and notices on the subject of jade, amounting to about three hundred in number, which have appeared in various scientific journals and transactions, reports and publications of societies, &c., in Germany, America, Great Britain, France, and Italy during the past twenty years.

The whole subject of the superstition attached to various stones is a wide and a very interesting one. It lies at the root of much of the esteem in which precious stones are held, apart from their beauty. Even at the present day in this country many people firmly believe in lucky and unlucky stones. How many people consider opals unlucky, and will neither wear them or give them to anyone, although they are the most beautiful of stones; whilst jade, which is ugly and unattractive-looking, is highly esteemed as lucky.

8.—The Microscope and Food Adulteration.

By Lester Reed, F.I.C., F.C.S.

(Read December 16th, 1903.)

While the analyst depends chiefly upon chemical methods for his qualitative, and almost entirely so for his quantitative work, it would be impossible to avoid falling back upon the invaluable help of the microscope in many cases. I propose this evening to pass briefly in review a few of these.

When a sample of flour is submitted for analysis, the question of admixture with foreign starches is almost wholly a microscopical one, and it is fortunate for our purpose that the shapes and other characters of starch granules are as distinctive as they are.

With a microscope of very moderate power it is possible to become intimate with some of the more striking peculiarities of some of the more common starches, and with the use of a polarizer further distinctions may be brought to light. We cannot assign a fixed or invariable diameter to any particular starch. We have only the average diameter to go by, if we attempt to judge by size alone.

Potato-starch granules are some of the largest, and may be roughly compared to oyster-shells, which they resemble not only in outline, but in their concentric, distinct, ring-like markings; with polarized light they give a well-marked cross, and show colours well with selenite; their size is from 60 to 100 microns (the micron being ·001 millimetre).

In wheat-starch the markings are comparatively faint, and a near approach to the circular form is often attained.

Maize-starch is smaller than that of wheat, and somewhat angular in form.

Rice-starch is still smaller, and very angular.

The natural starches of cocoa and pepper are very small, the latter from 0.5 to 5 microns.

If we are at any time in doubt whether the objects we are looking at under the microscope are starch granules or not, there is a very simple test by which the point may be decided. We introduce a droplet of iodine solution under the cover-glass. This solution is pale straw-coloured, but whenever it reaches and passes a starch granule, the latter becomes deep blue, approaching to black, if the iodine solution be strong. This is due to the fact that a blue compound, commonly called iodide of starch, is formed by the action of the iodine upon the starch, of which the granule is mainly composed.

Starch is to be regarded as a definite chemical substance, having an existence and identity independently of its granular structure; nor is the granule necessarily composed entirely of one substance. It is a small structure built up chiefly of starch, on a plan varying with the nature of the plant from which it is derived. Starch is a substance allied to sugar and to cellulose, having, in common with these, the peculiarity that it consists of carbon united to hydrogen and oxygen, the two last being in the exact proportions in which they exist in water; so that if we remove the elements of water from starch, sugar, or cellulose, a black mass of carbon remains, and all these substances are therefore charred by strong sulphuric acid (which has a great attraction for water) for this reason.

Occasionally a chemist requires to ascertain whether a particular fibrous structure is cellulose or not, and, although a mere examination of structure with the microscope may be sufficient to distinguish, for example, fibres of scraped leather from those of cotton or paper (cellulose), it is convenient to apply, as a confirmation, a colour-test in this case also.

Iodine, however, under ordinary circumstances will not give any such blue colour with cellulose, as it will with starch, but in the presence of chloride of zinc it will do so. So that if we mix together fibres of cotton and leather, and treat them dry on a slide with the iodine and chloride of zinc solution, and then place the cover-glass over, we see all the cotton fibres blue, while those of leather are colourless.

Another colour reaction may be made use of to detect ferruginous particles in drinking-water. We allow a drop of the water, containing some of the particles to be examined, to dry on a slide, warming it, until it does so, over a small flame, then, having placed on a cover-glass a drop of mixed solution of ferrocyanide of potassium and hydrochloric acid, we invert this on to the dried residue of the drop, and upon examining under the microscope shall probably see one or more bright blue particles; these are due to the formation of prussian blue, by the action of these reagents upon the iron-containing particles originally suspended in the water that was to be examined.

Perhaps one of the most common uses of the microscope for the detection of adulteration is in the case of coffee wherein we have to search for chicory. In this case I have not yet been able to find any chemical reagent which will give satisfactorily a characteristic effect visible in the microscope, and it seems to be necessary to rely, as regards the microscopical examination, upon differences of structure only. The presence of chicory, if that substance appears to be present, must of course be confirmed by independent chemical tests. Chicory contains sugar and sodium, neither of which are present to any extent in normal coffee, and

it is quite conceivable that some microscopical test might be found, based upon these distinctions.

The presence of crystals or fragments of alum in flour may be rather prettily demonstrated by moistening a little of the flour on a slide with a mixture of tincture of logwood and carbonate of ammonia solution. A microscopical examination then shows a slaty blue patch on a pink ground wherever there was originally a fragment of alum.

Much may be done with the microscope in the recognition of definite crystalline forms and characteristic crystal groupings; these are of some help in the identification of alkaloids. We are accustomed to think of crystals as hard, yet so soft a substance as butter readily takes a crystalline shape, and, indeed, its crystals are to a certain extent, and especially when viewed by polarized light, characteristic of the substance. If butter be melted and allowed to cool, its appearance is quite altered; it becomes glistening from the breaking up of light from its innumerable crystal faces. When we find such crystals in butter, we have proof that it has been melted, and a suspicion may be aroused of admixture, while melted, with other fats, which suspicion may, or may not, be confirmed by subsequent chemical analysis.

"Dr. Thomas Taylor (of the U. S. Department of Agriculture)" (I quote from J. P. Battershall) "has made an elaborate investigation of the microscopic appearance of various fats when viewed by polarized light. He regards the presence of peculiar globular crystals and the black cross commonly termed St. Andrew's cross as characteristic of genuine butter. Lard, beef, and other fats are said to exhibit different and, to some extent, distinctive crystalline forms. Prof. Weber, however, affirms that mixtures of lard and tallow fat, under certain conditions, cannot be distinguished from butter by means of this method of examination. More recently, Dr. Taylor states that the distinguishing difference between butter and other fats under the microscope is, that the former, when observed by polarized light through a selenite, exhibits a uniform tint, whereas the latter shows prismatic colours. Although the results of these investigations cannot as yet be considered as perfectly satisfactory or conclusive, they certainly are entitled to rank as a highly valuable and important step in advance of the optical processes hitherto employed."

Quantitative determinations by methods of counting under the microscope are in some cases possible. Speaking of the application of such methods to starches, A. W. Blyth says: "If adulteration in any case has been made out, approximative quantitative results may be obtained by making a standard mixture of the genuine starch with the adulterant found, and then counting the individual grains in the microscopic field. Thus, for example,

supposing oatmeal to be found adulterated with barley-starch, and from a preliminary examination the mixture supposed to be 40 per cent., we proceed as follows:—

"Pure barley-meal and oatmeal are carefully dried at 100° C., and mixed so that the mixture is exactly 40 per cent. A few grains of this powder are now rubbed up with glycerine and alcohol into a smooth paste, which is then further diluted to a certain bulk, a drop taken out with a glass rod, and covered with a glass, which is gently pressed down. The number of grains of barley- and oat-starch are now counted, and their relative proportion noted; and an exactly similar process is applied to the oatmeal in question. If proper care is taken to repeat the experiments, the result is a near approximation to the truth."

In the case of many starches, however, we should probably meet with the difficulty, that while you may be able readily enough to identify and count certain of the granules in view, there are many others less characteristic and of sizes varying from the average.

Milk, when observed under the microscope, shows fatty globules. The fat-globules are lighter than the liquid in which they float, as regards specific gravity, and, consequently, when milk is allowed to stand, we have a layer of cream. The larger of these globules reach the surface first, and some of the more minute never get there. There will therefore be only the smaller globules to be seen in skim milk, so that the size of the fat-globules may be to some extent an indication of the particular form of adulteration which consists in the abstraction of cream. Starch granules in milk would of course be readily detected by the iodine test.

Occasionally the microscope is of use in identifying a crystalline precipitate in the ordinary course of qualitative analysis, as in the case of the ammonio-phosphate of magnesia, or of iodide of lead after solution in hot water and reprecipitation by cooling, when beautiful iridescent yellow hexagons of very perfect form are seen.

By the aid of photography it is possible to render permanent our microscopical observations, but the great advantage of colour is lost; indeed, for the purpose of training one's powers of observation, and of fixing in the memory the appearance of objects, I doubt if there is anything much better than to practice one's self in making coloured sketches of them.

Instances of the use of the microscope in food analysis might be multiplied; but perhaps enough has been said to show that the microscope is a very valuable adjunct to chemical work, and that there exists a wide field for the devising of simple but characteristic tests by means of observations with the instrument.

9.—List of Fossils Collected.

By W. Murton Holmes.

From the Chalk obtained from the Cutting and Tunnel between Coulsdon and Merstham, L.B. & S.C.R.

Radiolaria.—Twenty genera, forty-one species.

Spongida.—*Placotrema cretaceum*, *Ventriculites decurrens*, *V. impressus*, *V. alcyonoides*, *V. radiatus*, *Plocoscyphia*, *Camerospongia*, *Porosphæra pileolus* (one specimen), *Porosphæra* sp. (irregular-lobed form, two specimens).

Actinozoa.—*Parasmilia centralis*, *P. serpentina*.

Bryozoa.—*Truncatula alternata*, and other Bryozoa.

Echinodermata.—*Bourgueticrinus ellipticus*, *Pentacrinus Agassizi*, *Pentagonaster Parkinsoni*, *Cidaris sceptrifera*, *C. clavigera*, *C. hirudo*, *Cyphosoma radiatum*, *Echinocorys vulgaris* var. *gibbus*, *Micraster cor-bovis* (type form), *M. cor-bovis* (passage form), *M. Leskei*, *M. Leskei* (passage form), *M. præcursor*, *M. cor-testudinarium*, *Holaster planus*, *H. placenta*, *Cardiaster Cotteaui*.

Annelida.—*Serpula ampullacea*, *Serpula* sp.

Brachiopoda.—*Crania egnabergensis*, *Terebratulina striata*, *T. gracilis* var. *lata* (Eth.), *Terebratula semiglobosa*, *T. carnea*, *Rhynchonella Cuvieri*, *R. plicatilis*.

Mollusca: Lamellibranchiata.—*Janira quinquecostata*, *Spondylus spinosus*, *Dianchora lata*, *Lima Hoperi*, *Ostrea semiplana*, *O. Normaniana*, *Plicatula sigillina*, *Inoceramus Cuvieri*, *I. mytiloides*, *Teredo amphisbæna*.

Gastropoda.—*Pleurotomaria perspectiva*, *Turbo gemmatus*.

Cephalopoda.—*Nautilus* sp., *Ammonites peramplus*.

Crustacea.—*Scalpellum maximum*.

Pisces.—*Oxyrhina Mantelli*, *Macropoma* (coprolite).

From the Haling Chalk-pit, Brighton Road, Croydon.

Spongida.—*Ventriculites radiatus*, *Ventriculites* sp.

Echinodermata.—*Bourgueticrinus ellipticus*, *Pentagonaster megaloplax* (Sladen), *Pentagonaster* sp., *Cidaris pernata*, *C. sceptrifera*, *C. hirudo*, *Cyphosoma Konigi*, *Echinoconus conicus*, *Micraster coranguinum*.

Annelida.—*Terebella Lewesiensis.*

Brachiopoda.—*Terebratulina striata, Terebratula semiglobosa.*

Mollusca: Lamellibranchiata.—*Ostrea Normaniana, Inoceramus, Spondylus spinosus, Lima Hoperi.*

Crustacea.—*Enoploclytia Sussexiensis.*

Pisces.—*Ptychodus rugosus, Lamna appendiculata, Scapanorhynchus rhaphiodon* (Ag.). *Corax falcatus, Oxyrhina Mantelli, Notidanus microdon, Enchodus* sp., *Cladocyclus Lewesiensis;* Fish Coprolites.

From the Chalk-pit at Whyteleafe, Surrey.

Spongida.—*Ventriculites impressus, V. radiatus.*

Echinodermata. — *Cyphosoma radiatum, Echinoconus subrotundus, Holaster planus.*

Brachiopoda.—*Terebratulina gracilis* var. *lata* (Eth.), *Terebratula semiglobosa.*

Mollusca: Lamellibranchiata. — *Spondylus spinosus, Inoceramus Cuvieri.*

Cephalopoda.—*Nautilus* sp., *Prionocyclus Neptuni* (Geinitz).

Reptilia: Plesiosauridæ.—*Polyptychodon interruptus.*

Pisces.—*Ptychodus mammilaris, Lamna appendiculata, L. semisulcata, Oxyrhina Mantelli, Corax falcatus, Protosphyræna ferox.*

10.—Report of the Meteorological Committee, 1903.

Prepared by the Hon. Sec., Francis Campbell-Bayard, F.R.Met.Soc.

(Read February 16th, 1904.)

The same arrangements, under which the daily rainfall of the district round Croydon has been observed and tabulated, have been continued throughout the year 1903. The number of stations in the printed list is 89, and there are three additional stations—*viz.* the County Hall, Kingston; Fox Hill Gardens, Upper Norwood; and the Sewage Works, Sutton—the records of which are complete for the whole year, and which will be found at the end of this Report. These 92 stations are under the superintendence of 74 observers. Two changes have occurred in consequence of the removal of the observers, *viz.* Mr. A. E. Watson, who left the Whitgift at the end of July; and Miss Percy, who left Feniton,

Farnborough, at the end of October. Mr. Watson's record, commencing in April, 1899, is, I am happy to say, in the possession of your Committee; and efforts are being made to obtain a complete set of the records at Farnborough, which commenced in 1896. A great loss has, however, been sustained at the beginning of this present year through the death of Mr. W. H. Tyndall, of Redhill, on January 13th, at the great age of ninety-one years. Through the courtesy of Mr. Tyndall, your Hon. Sec. was some time ago presented with a copy of his rainfall record at Redhill, commencing with January, 1867.

Appendix I. to this Report contains a list of the observers, with particulars relating to the stations and gauges, and also the monthly tables of daily rainfall, of which a sufficient number have from month to month been pulled for the use of the Society. These printed tables contain the records of all observers, with the exceptions already mentioned, reporting to the Committee.

Appendix II. contains a record of all falls of rain of 1·00 in. and upwards, extracted from the monthly tables in Appendix I.

In dealing with the rainfall records of this very remarkable wet year, it is extremely difficult to know where to begin, and it is, I fear, by no means impossible to forget some important feature. One of the great points to be remembered, as I mentioned in my presidential address last month, is, that we here, just south of the Thames, have had the largest year's rainfall that has been experienced in this district for a very great number of years. If we may take the long rainfall record of Greenwich, commencing in 1815, as a standard—though, by-the-by, the first 26 years are not considered very reliable, and have never yet been adequately discussed—there has been no such wet year since 1815, and it seems possible that the fall of 1903 has not been exceeded for quite a century.

With reference to the number of days on which a fall of one inch and upward fell, we have no less than 28 such days, a number which has certainly not been exceeded since these observations in the district have been started; but even more wonderful is the magnitude of the individual falls, and their widespread character. We have on May 30th two falls of over 3 in., on June 10th one such fall, and on July 23rd two falls of over 4 in. and no less than seven falls between 3 and 4 in.; and with reference to their widespread character, I should like to mention that the fall on June 10th occurred at no less than 56 stations, possibly more (for some of the gauges are monthly ones), out of 89; on July 23rd at 71 stations out of 88; on Aug. 11th at 41 stations out of 88; on Sept. 4th at 30 stations out of 88; and on Nov. 27th at 69 stations out of 87. Besides all this, some of the individual stations had no less than eight such falls—Denbies, Dorking, and Beddington Corner.

TABLE I.

THE RAINFALL OF 1903 AS COMPARED WITH THE AVERAGE OF THE TEN YEARS 1891–1900.

STATIONS	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Knockholt (F. G.)	+0·59	+0·29	+0·90	+0·77	+0·78	+3·71	+2·50	+1·50	+0·59	+4·40	—0·43	—0·68	+14·92
Dorking	+0·29	+0·03	+1·87	+0·91	+2·60	+3·93	+1·98	+3·80	+1·67	+4·52	—0·92	—0·66	+20·02
Caterham	0·00	—0·38	+1·34	+1·01	+1·54	+4·26	+1·40	+4·25	+0·27	+4·24	—0·77	—1·25	+15·91
Banstead	+0·37	—0·06	+1·29	+0·79	+1·63	+4·97	+3·06	+1·92	+1·06	+4·01	—0·74	0·00	+18·30
Addington Hills	+0·62	—0·06	+0·85	+0·66	+1·31	+4·97	+2·16	+1·61	—0·07	+2.37	—0·45	—0·53	+13·44
Nutfield (O. G.)	+0·13	—0·04	+0·83	+0·87	+1·34	+3·19	+2·05	+1·52	+0·35	+3·80	—0·43	—0·67	+12·94
Reigate Hill	+0·27	—0·17	+1·26	+0·73	+1·08	+3·68	+1·60	+2·05	+0·63	+3·31	—0·66	—0·86	+12·92
Sevenoaks	—0·13	—0·55	+0·36	+0·86	+0·88	+3·12	+3·62	+2·65	+0·28	+2·64	—0·53	—0·87	+12·33
Forest Hill (S. & V. W. C.)	+0·58	—0·10	+0·70	+0·82	+0·99	+4·43	+2·00	+1·98	+0·50	+1·98	—0·26	—0·82	+12·80
Addington (Pumping St.)	+0·57	+0·05	+1·22	+0·62	+0·63	+4·79	+2·02	+1·49	—0·22	+3·56	—0·35	—0·62	+13·76
Abinger (The Hall).....	+0·34	—0·05	+1·25	+1·12	+1·92	+3·23	+1·95	+3·12	+1·58	+5·03	—1·14	—0·23	+18·12
Farningham Hill.....	+0·61	+0·02	+0·49	+0·53	+0·54	+4·17	+3·86	+1·44	+0·73	+3·40	—0·15	—0·35	+15·29
Redhill (Oxford Road)...	+0·16	—0·16	+1·26	+0·75	+1·31	+3·42	+1·19	+1·44	+0·67	+3·78	—0·69	—0·76	+12·37
Bickley	+0·58	—0·14	+0·41	+0·60	+1·08	+4·90	+3·64	+1·61	+0·18	+2·43	—0·42	—0·74	+14·13
D'Abernon Chase	+0·69	—0·32	+0·82	+0·83	+1·65	+5·24	+2·12	+2·79	+1·46	+3·17	—0·71	—0·45	+17·29
Addington (Park Farm)	+0·86	+0·31	+1·21	+0·79	+0·67	+5·93	+2·13	+1·94	—0·23	+3·19	—0·42	—0·55	+15·83
Leatherhead.....	+0·77	+0·01	+1·53	+0·94	+1·71	+4·65	+3·35	+3·66	+1·54	+3·75	—0·82	—0·35	+20·74
Sutton*	+0·36	—0·29	+0·66	+0·53	+1·04	+4·89	+2·22	+2·19	+0·99	+2·72	—0·53	—0·25	+14·53
Forest Hill (Newfield H.)	+0·67	—0·22	+0·48	+0·85	+1·08	+4·42	+2·03	+1·65	+0·35	+1·72	—0·27	—0·72	+12·04
Orpington.....	+0·47	—0·15	+0·57	+0·46	+0·62	+4·18	+3·67	+1·04	+0·18	+2·68	—0·42	—0·41	+12·89
W. Norwood.....	+0·58	—0·31	+0·41	+0·68	+1·69	+4·80	+1·90	+1·75	+0·61	+1·67	—0·51	—0·94	+12·33
Oxshott.....	+0·62	—0·21	+0·93	+0·82	+1·48	+4·90	+1·96	+2·51	+1·63	+2·72	—0·67	—0·45	+16·24

THE RAINFALL OF 1903 AS COMPARED WITH THE AVERAGE OF THE TEN YEARS 1891–1900 (*contd.*).

STATIONS	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Beckenham*	+0·58	—0·12	+0·45	+0·64	+1·65	+5·06	+2·82	+1·88	+0·18	+1·71	—0·34	—0·54	+13·97
Nunhead	+0·53	—0·45	+0·30	+0·65	+0·88	+4·22	+2·09	+2·08	+0·51	+1·64	—0·58	—0·89	+10·98
Sidcup	+0·55	—0·07	+0·62	+0·76	+0·76	+4·17	+4·46	+1·71	+0·36	+2·50	—0·12	—0·52	+15·18
Croydon (Duppas House)	+0·34	—0·27	+0·62	+0·56	+2·42	+5·46	+2·16	+1·48	+0·04	+2·01	—0·44	—0·34	+14·04
Wimbledon Hill*.....	+0·60	—0·48	+0·77	+0·71	+1·30	+4·35	+2·35	+1·70	+0·75	+2·08	—0·46	—0·80	+12·87
Greenwich	+0·63	—0·30	+0·70	+0·68	+0·50	+4·50	+3·22	+2·60	+0·50	+1·58	—0·39	—0·89	+13·33
Croydon (Waddon N.R.)	+0·52	—0·23	+0·69	+0·61	+2·51	+6·04	+2·35	+1·68	+0·19	+2·26	—0·25	—0·33	+16·04
Wallington	+0·52	—0·13	+0·69	+0·44	+3·94	+5·38	+2·57	+1·69	+0·83	+2·77	—0·35	—0·41	+17·94
Croydon (Brimstone Bn.)	+0·59	—0·05	+0·56	+0·49	+1·93	+6·45	+2·29	+1·27	+0·16	+2·19	—0·15	—0·24	+15·49
South Norwood*	+0·75	—0·18	+0·67	+0·96	+1·70	+5·14	+2·26	+2·02	+0·55	+1·81	—0·37	—0·52	+14·79
Beddington	+0·56	—0·13	+0·69	+0·45	+3·05	+5·33	+2·27	+1·67	+0·39	+2·31	—0·48	—0·53	+15·58
Richmond*	+0·51	—0·67	+0·61	+0·57	+2·21	+4·87	+2·11	+0·95	+1·24	+2·10	—0·86	—0·86	+12·78
Brixton.....	+0·61	—0·45	+0·49	+0·85	+1·96	+4·68	+3·21	+2·09	+0·64	+2·28	—0·34	—0·92	+15·10
Wimbledon (Sew. Wks.)	+0·47	—0·46	+0·47	+0·49	+3·22	+4·19	+2·55	+1·53	+0·65	+1·70	—0·29	—0·73	+13·79
Raynes Park	+0·47	—0·68	+0·35	+0·52	+1·22	+4·27	+2·37	+1·58	+0·68	+1·91	—0·69	—0·96	+11·04
New Malden.....	+0·41	—0·63	+0·31	+0·29	+0·57	+4·26	+2·09	+1·79	+0·70	+1·68	—0·78	—0·87	+ 9·82
Esher	+0·84	—0·36	+1·10	+0·62	+0·55	+4·47	+1·22	+1·66	+1·50	+2·47	—0·63	—0·50	+12·94
Kingston	+0·65	—0·52	+1·02	+0·67	+0·69	+4·93	+2·84	+1·59	+1·20	+2·25	—0·77	—0·77	+13·78
Surbiton	+0·71	—0·52	+0·88	+0·41	+0·35	+4·79	+2·06	+1·60	+1·30	+2·16	—0·65	—0·63	+12·46
Wilmington	+0·63	—0·10	+0·38	+0·49	+0·42	+3·54	+3·92	+1·61	+0·53	+2·27	—0·32	—0·46	+12·91
Battersea	+0·45	—0·54	+0·32	+0·70	+1·89	+4·00	+2·35	+2·16	+0·33	+1·81	—0·35	—0·94	+12·18
Deptford	+0·66	—0·29	+0·59	+0·67	+0·77	+4·36	+2·56	+2·47	+0·51	+1·67	—0·36	—0·81	+12·80

With reference to the rainfall of 1903, I have prepared Table I. This table consists of 44 stations from amongst the 48 whose averages for the ten years are given in the Report for 1900, the stations for which the individual records are not the same being marked with a *. If we examine this table carefully, we shall see that, with two exceptions, *viz.* Caterham and Sevenoaks, the rainfall of January was above the average; that it was below the average in February, except at Knockholt, Dorking, Addington (Pumping Station), Farningham Hill, Addington (Park Farm), and Leatherhead; that in March, April, May, June, July, and August it was above the average at every station; that in September it was above the average, except at Addington Hills, Addington (Pumping Station), and Addington (Park Farm); that in October it was above the average at every station; that it was below the average in November at every station, and likewise also in December, with the single exception of Banstead; and, on the year's average, that it was above at every station. The month of June is the most remarkable of these months; there the excess varied from 6·45 in. at Brimstone Barn, Croydon, to 3·12 in. at Sevenoaks; then would appear to come July, with an excess of 4·46 in. at Sidcup to 1·19 in. at Redhill; and after that May, with an excess from 3·94 in. at Wallington to 0·62 in. at Orpington. The excess on the year's average varied from 20·74 in. at Leatherhead and 20·02 in. at Dorking to 9·82 in. at New Malden and 10·98 in. at Nunhead.

That the year has been an extremely wet one has already been shown by the amount of rain, but it can also be demonstrated in another way by comparing the number of rainy days with the average of the ten years 1891–1900. For this purpose I have prepared Table II. from my own observations at Wallington, and Table III. from the Greenwich observations.

TABLE II.

Number of Rainy Days at Wallington, Surrey.

Average of 10 years	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
1891–1900	18	14	13	11	11	11	10	15	12	16	16	17	164
1903	17	12	19	12	14	13	14	19	15	25	20	13	193

TABLE III.

Number of Rainy Days at Greenwich Observatory, Kent.

Average of 10 years	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
1891–1900	16	12	14	11	12	12	12	15	12	16	15	16	163
1903	16	11	18	12	16	11	13	18	16	27	15	11	184

These two tables present some curious anomalies, but yet there is a certain agreement. The most curious feature is the month of June. Though this month was extremely wet, yet at Wallington the number of rainy days was only two in excess, and at Greenwich even one below the average. The number of rainy days in October is at both places very much above the average. December was much below the average at both places.

Through the courtesy of Mr. Baldwin Latham, I have this year been furnished with the following figures for 1903. The actual number of hours during which rain fell during the year was 756·7 hours, which gives the actual number of days of twenty-four hours each as 31·5 days, and the actual annual rate of fall as ·0512 in. per hour. The greatest rate of fall occurred in July, which has ·0805 in. per hour; May had the next, namely, ·0728 in. per hour; and June had the third, namely, ·0603 in. per hour; whilst April had the lowest rate of fall, namely, ·0280 in. per hour. In November the bourne broke out at Marlpit Lane, Carshalton, and Ewell.

It is out of place for this Committee to deal with the effects of this great rainfall on human life and on vegetation, but I think that perhaps a few words as to its effects on human life would not be considered out of place. The year has undoubtedly been a healthy one, so far as human life is concerned. The death-rate has been low, and diphtheria, enteric and other fevers have not, as a whole, been prevalent. There is no doubt that the cleansing the soil by the rainfall has greatly contributed to this immunity. Our holidays have been spoilt, but we have had great compensations in other ways. With respect to the influence of the rainfall on vegetation, this can better be dealt with by the Botanical Committee.

In conclusion, the Committee desire to thank those, fifteen in number, who have given donations in aid of this rainfall work, which evidently supplies a want which has been felt for some time.

The County Hall, Kingston, Surrey.

Observer—E. Underwood. Gauge 5 in. in diameter.

Height of gauge above ground, 9 in.
Height of station above sea-level, 31 ft.
Time of observation, 7.30 a.m.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
2.44	1·12	2·57	1·69	2·07	6·37	4·48	4·30	3·21	5·02	2·04	1·51	36·82

3, Fox Hill Gardens, Upper Norwood, Surrey.

Observer—Windham H. R. Ryves. Gauge 5 in. in diameter.

Height of gauge above ground, 9 in.
Height of station above sea-level, 300 ft.
Time of observation, 9 a.m.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
2·10	1·32	2·07	2·05	3·13	5·61	4·38	3·78	2·30	5·12	2·22	1·48	35·56

The Sewage Works, Sutton, Surrey.

Observer—C. Chambers Smith. Gauge 8 in. in diameter.

Height of gauge above ground, 1 ft.
Height of station above sea-level, 94 ft.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
2·40	1·27	2·00	1·77	2·32	6·79	4·45	4·35	3·06	5·21	2·09	1·93	37·64

APPENDIX I.

CROYDON NATURAL HISTORY AND SCIENTIFIC SOCIETY

(Meteorological Committee.)

No.	Stations.	Observers.	Size of Gauge.	Height above Ground.		Height of Stat. ab. Sea-level.
			IN.	FT.	IN.	FT.
	Holmbury St. Mary (Ioldwynds)	F. Cornish	5	1	0	530
	Abinger (The Rectory).....	Miss Brodie-Hall....	5	1	0	381
	Abinger (The Hall)	The Lord Farrer	8	2	0	320
	Dorking (Denbies).....	J. Beesley	5	0	6	610
5	Redhill (Oxford Road)	W. H. Tyndall.....	8	1	0	300
	Redhill (Linkfield Lane)	Mrs. Stephenson	5	1	0	350
	Nutfield (The Priory)	J. Moffatt	8	1	2	468
	Nutfield (The Priory) 2nd gauge	J. Moffatt	8	1	2	331
	Buckland (Hartswood)	R. W. Clutton	5	1	$0\frac{1}{2}$	174
10	Reigate Hill (Nutwood Lodge)..	H. E. Gurney	5	1	0	440
	Upper Gatton (The Park).....	F. Druce	5	1	0	600
	Merstham (Rockshaw Lodge)....	T. W. Hill.....	5	1	0	475
	Harp's Oak Cottage	R. C. Grant	5	1	0	454
	Chipstead (Shabden Park)	J. Crerar	5	1	0	550
15	Chaldon (The Rectory)	Rev. G. E. Belcher ..	5	1	0	542
	Caterham (Metropolitan Asylum)	P. E. Campbell, M.D.	5	1	0	610
	Westerham (Hill Estate).....	W. Morris	5	1	0	539
	Westerham (The Town)	W. Morris	5	1	0	380
	Knockholt Beeches (Field Gauge)	W. Morris	5	1	0	785
20	Knockholt Beeches (Tower Gauge)	W. Morris	5	24	6	812
	Chevening (The Park).....	C. Sutton	5	1	0	360
	Sevenoaks (St. John's Hill)	W. W. Wagstaffe	5	1	10	380
	Chelsham (Fairchildes)	A. S. Daniell	8	1	0	600
	Warlingham (Egremont).....	H. Rogers	5	1	0	614
25	Kenley (Hazelea)	Mrs. Carr-Dyer	5	1	0	282
	Sanderstead (The Red House) ..	Capt. Carpenter, R.N.	5	1	0	320
	Burgh Heath (The Reservoir)....	Sutton Dis. Water Co.	5	1	0	580
	Leatherhead (Downside)	A. Tate	5	1	0	250
	D'Abernon Chase	Sir W. Vincent, Bart.	5	1	0	280
30	Oxshott (Beverstone)	W. H. Dines.....	5	1	0	212
	Banstead (The Hall)	E. J. Maitland	8	1	0	488
	Sutton (Carshalton Road)	Sutton Dis. Water Co.	5	1	0	110
	Benhilton (Angel Hill)	J. C. M. Stanton	5	1	3	125
	Carshalton (Sewage Works)	W. W. Gale	5	1	0	118
35	Wallington (Maldon Road).....	F. Campbell-Bayard	5	4	1	140
	Beddington (Riverside)	S. Rostron	5	1	0	120
	Croydon (Brimstone Barn).....	Croydon Corporation	5	1	0	130

No.	Stations.	Observers.	Size of Gauge.	Height above Ground.		Height of Statn. ab. Sea-level.
			IN.	FT.	IN.	FT.
	Croydon (Waddon New Road)....	Croydon Corporation	5	1	0	146
	Croydon (Duppas House)	Baldwin Latham	8	1	0	158
40	Croydon (Whitgift)	A. E. Watson	5	1	0	191
	Croydon (Windmill Road)	A. Malden	5	1	6	174
	Croydon (Park Hill Rise)	H. F. Parsons, M.D.	5	1	0	250
	Croydon (Ashburton Road).....	J. E. Clark	5	1	0	188
	Addington Hills (The Reservoir)..	Croydon Corporation	8	0	9	473
45	Addington (Park Farm)	W. Whalley	5	1	0	268
	Addington (Pumping Station)....	Croydon Corporation	8	1	0	331
	West Wickham (Wickham Court)	Sir H. F. Lennard, Bt.	5	1	2	300
	Hayes (Hayes Place)	W. Beale	8	1	0	350
	Farnborough (Feniton)	Miss Percy	5	1	0	376
50	Orpington (Kent Water Co.)	W. Morris	5	1	0	220
	Farningham Hill (Hill House) ..	A. J. Waring	5	3	0	300
	Southfleet (Kent Water Co.)	W. Morris	5	1	0	82
	Chislehurst (Hawkwood)	Miss Edlmann	5	1	0	300
	Bickley (The High Field)	J. Batten	5	1	2	295
55	Bromley (The Palace)	Coles Child	5	1	0	187
	Bromley Common (Elmfield)	Rev. J. P. Faunthorpe	5	0	9	240
	Beckenham (Wickham Road)....	E. Scovell.....	5	1	2	155
	Anerley (The Town Hall)	H. W. Longdin.....	8	40	0	191
	South Norwood (Woodvale)	E. Dean	5	1	0	216
60	Beddington Corner (Millgreen Rd.)	G. Miller	5	5	0	77
	Morden (Steel Hawes)	Miss R. Hames.....	5	5	2	100
	Wimbledon (Sewage Works)	C. H. Cooper	5	1	0	58
	Wimbledon (The Downs)	Francis Fox	5	1	1	162
	Wimbledon (The Windmill)	Jesse Reeves.....	5	1	0	172
65	Raynes Park (Pumping Station)..	C. H. Cooper	5	1	0	47
	New Malden (Sewage Works)....	T. V. H. Davison....	5	1	0	45
	Worcester Park (Manor Lodge)..	F. D. Outram	5	1	9	120
	Esher (Sewage Works).....	A. J. Henderson	5	1	0	40
	West Molesey (Chelsea Water Co.)	H. Wrinch.....	5	1	0	32
70	Surbiton (Chelsea Water Co.)....	H. Wrinch.....	10	0	6	25
	Kingston (Sewage Works)	T. Stevens.....	5	1	0	25
	Richmond (The Terrace)	J. H. Brierley	8	1	6	109
	Putney Heath (The Reservoirs)..	H. Wrinch.....	5	1	0	180
	Wandsworth Com. (Patten Road)	F. J. Brodie	5	1	0	100
75	Clapham Park (New Park Road)	D. W. Horner	5	1	3	128
	Streatham (Woodfield Avenue)...	F. Jordan	5	1	0	120
	West Norwood (Thornlaw Road)..	W. Marriott	5	1	0	220
	Up. Norwood (Dulwich-wood Park)	T. P. Caldicott	5	1	2	276
	Forest Hill (Dartmouth Road) ...	L. W. F. Behrens ..	5	1	0	220
80	Forest Hill (S. & V. Water Co.)..	J. W. Restler	5	1	0	344
	Sidcup (Hatherley Road)	Lionel Burrell, M.D.	5	1	2	160
	Wilmington (Kent Water Co.)....	W. Morris	5	1	0	25
	Dartford (West Hill House)	Lieut-Col. C. N. Kidd	5	1	3	100
	Eltham (High Street)	W. Morris	5	1	0	245
85	Greenwich (Royal Observatory)..	Astronomer Royal ..	8	0	5	155
	Deptford (Kent Water Co.)	W. Morris	5	1	0	20
	Nunhead (S. & V. Water Co.)....	J. W. Restler	5	4	0	176
	Brixton (Acre Lane).....	F. Gaster	8	1	0	77
	Battersea (S. & V. Water Co.) ...	J. W. Restler	5	3	0	21

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·19	·30	·27	·20	·10	·10	·12	·14	·16	·08	·14	·13	·12	·15	·14	·13	·16	..			..	·22		·22	·16	·17
2	·20	·07	·05	·12	·17	·20	·18	·18	·19	·16	·13	·16	·17	·12	·17	·16	·18	·29			·05	·09		·10	·11	·11
3	·10	·10	·09	·15	·14	·13	·12	·12	·12	·17	·19	·14	·18	·12	·15	·15	·16	·14			·23	·10		·11	·12	·07
4	·70	·75	·73	·65	·67	·66	·70	·67	·68	·65	·74	·74	·76	·78	·75	·76	·82	·80			·87	·81		·85	·76	·78
5	·11	·10	·06	·07	·08	·11	·04	·04	·07	·05	·10	·06	·08	·06	·35	·07	·07	·06			·06	·05		·07	·04	·04
6	·16	·24	·17	·23	·21	·22	·14	·17	·15	·18	·18	·18	·15	·17	·15	·19	·18	·11			..	·15		·20	·13	·12
7	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..			..	..		..	·01	..
8	·07	·07	..	·07	·05	·07	·05	·05	·04	·06	·06	·05	·05	·07	·05	·05	·04	·04			·06	·03		·02	·05	·04
9	·09	·09	·13	·08	·06	·06	·05	·04	·05	·05	·13	·05	·07	·08	·06	·04	·03	·03			·04	05		·09	·04	·05
10	·14	·03	·09	·06	·08	·11	·07	·09	·07	·09	·10	·15	·10	·08	·12	..	·14	·07			·11	·03		·13	·07	·07
11	..	..	..	..	..	..	..	..	..	·03	·01	..	..	·01	..	·04	..	..			..	..		..	·10	..
12	..	..	·01	..	·03	..	·02	·02	·02	·01	·01	·02	..	..	..	..	·11	..			·05	·05		·01	·01	..
13	..	..	..	..	·01	..	·01	·01	..	..	..	..	..	..	..	..	..	..			·02	..		·01	..	..
14	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
17	·30	·34	·30	·30	·23	·25	·22	·22	·25	·23	·22	·24	·22	·25	·25	·28	·15	·33			·21	·30		·29	·18	·18
18	·09	·06	·05	·13	·06	·08	·04	·05	·08	·07	·06	·05	·04	·05	·04	..	·02	·04			·05	·04		·04	·05	·03
19	·02	·01	·02	·03	·03	·06	·03	·03	·02	·04	·04	·04	·05	·03	..	·05	·06	·06			·06	·04		·05	·03	·04
20	..	..	·01	..	..	..	·01	·01	..	·01	..	..	..	·01	..	..	..	..			..	..		..	·01	·01
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·04	·01	..	·01			..	..		..	..	..
22	·12	·11	·11	·11	·16	·17	·15	·16	·14	·20	·16	·17	·16	·18	·19	·19	·18	·15			·18	·15		·22	·18	·16
23	..	·04	..	..	..	..	..	..	..	·01	..	..	·01	..	..	·01	..	..			·03	..		..	·01	·01
24	·06	·06	·05	·18	·08	·08	·08	·07	·08	·08	·11	·10	·10	·09	·11	·10	·16	·15			·14	·09		·11	·08	·06
25	·04	·03	·03	·02	·02	·03	·02	·02	..	·02	·05	·03	·04	·03	·05	·05	·03	·03			·02	·02		·04	·02	·02
26	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..			·01	..		..	..	..
27	·36	·44	·48	·40	·28	·29	·23	·23	·24	·28	·32	·25	·29	·30	·30	·27	·16	·15			·17	·15		·29	·33	·34
28	..	..	..	..	..	..	..	..	..	·01	..	·01	..	·01	..	..	..	..			..	..		..	·01	..
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
31	·10	·12	·13	..	·12	·12	·05	·07	·11	·10	·08	·06	·10	·08	·12	·08	·05	·06			..	·05		·07	10	·09
*	2·86	2·96	2·78	2·80	2·58	2·74	2·33	2·39	2·49	2·58	2·83	2·63	2·69	2·67	3·04	2·65	2·70	2·52	2·94	1·99	2·36	2·42	2·47	2·90	2·60	2·39
†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farning-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·17	·17	·10	·14	·10	·10	·04	·10	·10	·10	·14	·12	·12	·11	·10	·07	·13	·11	·15	·13	·06	·06	·13	·20	·13
2		·07	·05	·08	·13	·06	·04	·10	·07	·08	·06	·06	·08	·08	·05	·07	·10	·11	·17	·12	·11	·08	·23	·11	·10	·01
3		·09	·07	·06	·09	·05	·07	·05	·07	·06	·06	·05	·05	·06	·07	·06	·07	·09	·11	·09	·07	·09	·08	·09	·12	·06
4		·69	·84	·79	·64	·80	·80	·73	·81	·81	·80	·86	·79	·84	·82	·82	·81	·84	·93	·86	·92	·64	·85	·83	·82	·87
5		·04	·04	·04	·06	·01	·01	·07	·03	·04	·03	·03	·03	·05	·02	·03	·06	·03	·06	·03	·03	·04	·02	·03	·03	·03
6		·12	·03	·03	·16	·06	·04	·05	·12	·12	·10	·09	·10	·12	·11	·10	·10	·12	·14	·11	·07	·08	·15	·19	·27	·14
7		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..
8		·06	·06	·05	·05	·02	·02	..	·03	·04	·03	·03	·03	·04	·02	·03	·03	·04	·04	·04	·03	·03	·03	·02	·03	·02
9		·05	·05	·02	·07	·05	·04	·03	·06	·08	·06	·05	·05	·08	·05	·05	·04	·06	·08	·07	·05	·05	·02	·03	·04	·01
10		·07	·12	·11	·03	·05	·05	·04	·06	·06	·05	·06	·06	·07	·05	·05	·06	·06	·09	·08	·06	·06	·08	·08	·05	..
11		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12		..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..
13		..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..
14		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17		·30	·19	·20	·25	·24	·25	·22	·17	·14	·14	·15	·15	·17	·15	·16	·15	·16	·23	·20	·21	·14	·13	·15	·11	·14
18		·07	·04	·03	·04	·04	·03	..	·03	·05	·03	·03	·02	·03	·02	·02	·03	·02	·02	·01	·01	·02	·05	·02	·03	·03
19		..	·02	..	·01	·04	·02	·04	·03	·03	·04	·04	·04	·04	·04	·05	·05	·06	·08	·06	·04	·07	·09	·06	·07	·05
20		..	..	..	..	..	..	..	..	..	..	..	..	..	·01	·01	..	·01	..	..	..	..	·01	..	..	·01
21		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22		·11	·10	·12	·14	·11	·10	·10	·11	·11	·10	·11	·11	·11	·09	·10	·11	·14	·16	·17	·12	·10	·13	·12	·12	·09
23		..	·02	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	·03	..	..	·01	..	..	·01	·01
24		·07	·09	·08	·08	·07	·06	·05	·06	·07	·06	·06	·06	·06	·06	·06	·07	·07	·08	·09	·06	·05	·07	·06	·06	·03
25		·02	·02	·01	·01	·01	..	·02	·01	·01	..	·01	·01	·02	·01	·01	·02	·01	·02	·02	..	·01	·01	·01	·01	·01
26		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27		·48	·52	·48	·47	·42	·41	·37	·41	·39	·36	·42	·36	·36	·34	·35	·36	·38	·39	·34	·39	·24	·26	·22	·21	·18
28		..	..	·01	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..
29		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31		·17	·15	·12	·15	·15	·13	·14	·15	·17	·13	·09	·10	·13	·12	·10	·10	·12	·16	·16	·16	·11	·08	·08	·07	·11
*	2·60	2·58	2·58	2·34	2·52	2·28	2·18	2·07	2·32	2·36	2·15	2·28	2·16	2·39	2·14	2·17	2·23	2·45	2·92	2·60	2·46	1·92	2·35	2·23	2·36	1·93
†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

MONTHLY GAUGE.

* The totals for the month.

† The totals from January 1st.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·11	·10	·11	·12	·11	..	·10	..	·08	·07	·09	·09	·08	·08	·10	·11	·13	·10	·12	·13	·09	·11	·10	·10	·06	·04
2	·07	·07	·08	·10	·06	·06	·05	·13	·05	·03	·06	·05	·07	·07	·04	·10	·07	·10	·07	·03	·05	·02	·04	·03	·05	·05
3	·07	·07	·10	·07	·08	·04	·90	·07	·10	·17	·12	·08	·13	·11	·06	·13	·07	·14	·07	·05	·08	·10	·14	·10	·11	·12
4	·87	·93	·90	1·02	·87	·38	·08	·19	·76	·70	·80	·75	·81	·55	·81	·74	·72	·75	·83	·73	·73	·76	·82	·78	·86	·99
5	·02	·02	·03	·03	·03	·46	·03	·72	·05	·03	·03	·02	·03	·03	·02	·04	·03	·03	·03	·04	·04	·10	·04	·02	·03	·03
6	·06	·07	·09	·06	·07	·01	·08	..	·04	·02	·04	·08	·05	·05	·02	·07	·04	·10	·07	·03	·08	·03	·06	·04	·02	·03
7	..	..	..	..	..	·05	..	·03	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	·09	·03	·03	·03	·03	·02	·02	·02	..	·04	·05	·05	·05	·04	·04	·04	·03	·04	·03	·04	·04	·04	·06	·05	·03	·03
9	·04	·04	·06	·05	·04	·02	·05	·02	·05	·01	·02	·02	·02	..	·02	·01	·05	·01	·02	·05	·01	·01	·02	·04	·03	·03
10	·05	·04	·05	·06	·04	..	·06	·06	·03	..	..	..	..	..	·03	·02	·01	..	..	..	..	..	..	·01	·01	·03
11	..	..	..	..	..	·03	..	·06	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..
12	..	·01	..	..	..	..	..	..	..	..	..	..	·01	..	·01	..	..	..	..	..	..	..	..	·01	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	·14	·19	·18	·16	·20	·07	·21	..	·25	·25	·31	·38	·30	·27	·26	·37	·36	·33	·43	·47	·41	·39	·36	·31	·27	·20
18	·03	·03	·03	·03	·02	·13	·02	·28	·02	·02	·02	·02	·03	·03	·03	·05	·03	·03	·02	·03	·04	·02	·02	·02	·03	·05
19	·09	·08	·09	·09	·06	·05	·08	..	·03	·04	·03	..	·03	·02	·01	·02	·03	·02	·01	·04	·05	·04	·05	·04	·06	·10
20	..	..	..	..	..	·02	..	·03	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	·01	·01	·01
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	·01	..	..	..	..	..
22	·11	·11	·11	·11	·10	·06	·09	..	·10	·10	·10	·12	·09	·08	·10	·06	·10	·10	·10	·09	·08	·06	·12	·09	·10	·10
23	..	..	..	..	·02	..	..	·09	..	..	·01	·01	·03	..	..	..	..	..	..	..	·01	·01	..	·01	..	..
24	·08	·08	·10	·08	·07	·03	·06	·02	·06	·07	·05	·07	·07	·05	·06	·09	·07	·06	·07	·07	·06	·07	·08	·05	·06	·08
25	·01	·01	·02	·02	·02	·01	·01	·06	..	..	·02	..	·01	·02	·01	·02	·02	·01	·01	·02	·02	·01	·01	·01	·02	·02
26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	·30	·31	·31	·30	·34	·16	·37	·02	·42	·46	·42	·38	·45	·35	·43	·39	·38	·41	·42	·34	·36	·43	·45	·40	·39	·37
28	..	..	..	..	..	·13	..	·40	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	·01	..	..
29	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	·09	·14	·12	..	·11	·04	·14	..	..	·10	·11	·11	·13	·08	·13	·15	·14	·11	·16	·12	·11	·09	·12	·12	·13	·12
*	2·23	2·33	2·41	2·34	2·27	1·77	2·35	2·20	2·04	2·07	2·29	2·25	2·39	1·85	2·18	2·43	2·28	2·34	2·46	2·28	2·27	2·29	2·49	2·25	2·27	2·40
†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·09	·06	·10	·09	·06	·05	·07	·05	·05	·06	·06
2	·04	·07	·06	·05	·07	·05	·08	·08	·05	·07	·03
3	·15	·14	·10	·08	·10	·16	·10	·09	·10	·08	·06
4	·86	·81	·95	·90	·85	·90	·83	·77	·75	·76	·65
5	·06	·05	·03	·02	·02	·02	·03	·04	·02	·07	·02
6	·03	·03	·07	·12	·09	·07	·02	·01	..	·04	·05
7	..	..	..	..	..	..	..	..	..	..	..
8	·03	·03	·04	·02	·04	·01	·03	·03	·03	·05	·02
9	·04	·03	·05	·01	..	·03	·02	·02	·01	·02	..
10	·02	..	·03	·01	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..
12	·02	..	..	·01	..	·01	..	·01	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..
17	·21	·21	·17	·12	·17	·22	·29	·29	·19	·35	·30
18	·02	·03	·03	·04	·03	·03	·02	·02	·04	·02	·02
19	·08	·07	·07	·07	·06	·07	·09	·09	..	·05	·03
20	·01	·01	..	..	..	..	..	·01	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	·10	·10	·13	·10	·12	·11	·11	·10	·12	·10	·07
23	..	..	..	·01	..	..	..	..	·01	·01	..
24	·07	·07	..	·05	·05	·07	·07	·06	·03	·07	·04
25	·01	·01	·02	·01	..	..	·01	·01	..	·01	..
26	..	..	..	..	..	..	..	..	..	..	..
27	·35	·36	·26	·22	·23	·27	·33	·32	·31	·48	·32
28	..	..	..	..	..	..	..	..	..	..	..
29	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..
31	·12	·12	·10	·05	·10	·09	·15	·11	·06	·11	·05
*	2·31	2·20	2·21	1·98	1·99	2·16	2·25	2·11	1·77	2·35	1·72
†	..	..	..	..	..	..	..	..	..	..	..

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(January, 1903.)

The month has been very warm, somewhat wet, and very unhealthy, catarrhal affections being prevalent, though the mortality was not high. Diphtheria was more distributed than in December, though the cases were fewer, and scarlet fever was somewhat less prevalent. The third week was very cold, but the other weeks were mild. The thunderstorm on the 3rd was experienced throughout the district. The somewhat unusual occurrence of a silver thaw took place on the 17th. There was slight snow throughout the district on the 11th, 12th, and 13th. Solar halos were seen at Greenwich and Clapham Park on the 1st, 4th, and 17th, and at Upper Gatton on the 1st, and Wallington on the 17th; and a lunar one at Beddington on the 8th. Lightning was seen at Greenwich on the 2nd, 3rd, and 31st, and at Upper Gatton on the 4th and 24th. Owing to the mild weather the winter aconite flowered at Croydon on the 6th, the snowdrop on the 11th, and the yellow crocus on the 29th; and besides these there were primroses and many other flowers in bloom. The rainfall is about one-third of an inch above the average at Greenwich. The mean temperature of the month is about three degrees above the average, and was at Wallington 40°·8, at Croydon (Whitgift) 40°·7, at Croydon (Duppas House) 40°·6, at Worcester Park 40°, at Warlingham 39°·4, and at Chipstead 39°·1. There were recorded at Wallington 54·3 hours of sunlight, which is 12·1 hours or five per cent. above the January average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxford rd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (new gauge)	Buckland	Reigate Hill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·11	..	·06	·24	·11	·10	·09	·07	·02	·09	·04	·05	·01	·05	·05	·04	·07	·13			·08	·03		·03	·05	..
2	..	..	..	..	..	..	..	..	·01	·01	·01	·01	·02	·01	..	..	..	..			·06	·06		..	·01	·02
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
4	·04	·02	·02	..	·02	·02	·02	·02	·01	·01	·02	·01	·02	·02	·02	·02	·02	..			·02	·01		·02	·01	..
5	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
6	..	..	..	..	..	..	·01	·01	·01	..	·01	..	..	·01	..	..	..	·03			..	·01		..	..	..
7	·02	·02	..	..	..	..	·01	..	·01	·01	·02	·01	·01	·01	·02	·02	..	·01			·02	..		·02	·02	·01
8	..	..	..	..	·02	·02	·01	·01	·01	·01	..	..	..	..	..	..	..	·01			..	..		..	..	..
9	·02	..	..	..	·01	..	..	..	·01	..	·01	·01	·01	·01	..	·01	·03	..			·01	..		·01	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
15	·01	·03	·02	·06	·02	·02	·02	·02	·01	·02	·04	·03	·03	·04	·09	·04	..	·03			·06	·02		·05	·04	·04
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
19	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
20	..	..	..	..	..	..	..	..	·01	·02	·01	..	..	..	..	·01	..	..			..	..		..	..	..
21	..	..	..	·02	·01	·01	·02	·02	·01	..	·02	·01	·02	·03	..	·03	·02	..			·02	·02		..	..	..
22	·32	·30	·21	·22	·27	·25	·22	·25	·23	·21	·27	·27	·26	·21	·30	·11	·29	·33			·26	·21		·28	·16	·13
23	·06	·10	·13	·06	·05	·05	·04	·04	·02	·05	·06	·13	·07	·07	·07	·07	·09	·07			·05	·08		·09	·06	·03
24	·36	·43	·42	·46	·34	·35	·45	·54	·53	·40	·55	·27	·45	·41	·43	·42	·28	·17			·23	·10		·46	·36	·36
25	·16	·14	·19	·19	·07	·07	·10	·12	·08	·03	·13	·06	·09	·19	·09	..	·12	·16			·21	·06		·08	·24	·11
26	·30	·34	·35	·37	·22	·24	·05	·05	·14	·22	·25	·21	·21	·27	·24	·25	·18	·20			·19	·13		·28	·23	·20
27	·76	·64	·70	·50	·57	·61	·66	·66	·68	·56	·65	·75	·61	·64	·67	·61	·78	·66			·81	66		·67	·68	·66
28	·06	·12	·08	·09	·10	·11	·08	·06	·07	·12	·07	·09	·10	·07	·09	·10	·09	·08			·14	·07		·09	·09	·07
*	2·22	2·14	2·18	2·21	1·81	1·85	1·78	1·87	1·88	1·76	2·16	1·91	1·91	2·04	2·07	1·73	1·97	1·88	2·17	1·31	2·16	1·46	2·00	2·08	1·95	1·63
†	5·08	5·10	4·96	5·01	4·39	4·59	4·11	4·26	4·37	4·34	4·99	4·54	4·60	4·71	5·11	4·38	4·67	4·40	5·11	3·30	4·52	3·88	4·47	4·98	4·55	4·02

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Beddington	Croydon (Brim. Bn.)	Croydon (Wi.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farning-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·04	·03	·03	·01	·05	·02	·02	·04	·03	..	·04	·02	·04	·02	·01	·03	·03	·05	·04	·02	·03	·02	·02	·03	·03
2		..	·01	..	·03	·01	..	..	·01	·01	..	..	·01	..	..	..	..	..	·01	..	·02	·01	..	..	..	·01
3		..	..	..	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..
4		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..
5		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7		..	..	·03	·01	·01	·01	..	·02	·02	·02	·02	·02	·02	·02	·02	·01	·03	·02	·01	..	·02	·01	·01	·01	..
8		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
10		..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..
11		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15		·02	·02	·02	·03	·03	·02	..	·03	·02	·03	·03	·03	·03	·02	·03	..	·05	·06	·05	·04	·04	·06	·03	·03	·04
16		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..
17		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
21		·01	..	..	..	..	..	·02	·01	·01	..	·02	..	·01	..	·01	·01	·01	·01	..	..	..	·01	..	..	·01
22		·13	·13	·10	·16	·11	·08	·10	·10	·11	·09	·09	·09	·10	·08	·11	·11	·16	·20	·19	·18	·17	·17	·15	·18	·13
23		·05	..	·05	·04	·04	·03	..	·05	·05	·05	·04	·03	·05	·06	·05	·04	·04	·06	·04	·03	·06	·04	·04	·05	·04
24		·46	·30	·35	·44	·24	·20	·27	·33	·38	·35	·38	·36	·38	·36	·36	·39	·36	·45	·39	·39	·34	·35	·38	·34	·24
25		·22	·08	·08	·14	·16	·09	·14	·11	·09	·08	·09	·08	·09	·07	·09	·09	·11	·22	·23	·28	·23	·05	·05	·08	·07
26		·38	·21	·19	·47	·29	·16	·27	·28	·29	·26	·25	·23	·31	·25	·25	·26	·25	·36	·22	·20	·26	·14	·19	·15	·12
27		·55	·50	·47	·61	·47	·47	·41	·53	·56	·55	·54	·57	·54	·55	·54	·55	·61	·69	·66	·72	·66	·64	·63	·72	·68
28		·06	·09	·08	·07	·07	·06	·08	·07	·06	·06	·06	·07	·07	·06	·06	·10	·07	·17	·11	·08	·09	·09	·07	·11	·07
*	2·35	1·92	1·37	1·40	2·01	1·49	1·14	1·31	1·58	1·63	1·49	1·56	1·51	1·64	1·49	1·55	1·61	1·74	2·30	1·94	1·96	1·91	1·59	1·57	1·71	1·44
†	4·95	4·50	3·95	3·74	4·53	3·77	3·32	3·38	3·90	3·99	3·64	3·84	3·67	4·03	3·63	3·72	3·84	4·19	5·22	4·54	4·42	3·83	3·94	3·80	4·07	3·37

MONTHLY GAUGE.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·03	·03	·03	·13	·03	·06	·20	·16	·13	·07	·04	·07	·04	·03	·01	·03	·04	·02	·06	·04	·04	·09	·08	·06	·04	·03
2	..	..	·02	..	·01	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	·02	·01	·01	·01	..
3	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01
7	·02	·03	·03	·03	·03	..	·02	·01	..	·01	·02	·01	·02	..	..	·01	..	·01	..	·03	·02	·02	·02	·02	·02	·03
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..
10	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	·04	·05	·05	..	·02	·01	·03	..	..	·01	·02	·02	·02	·01	·02	..	·02	·01	·01	·02	·01	·01	·03	·03	·03	..
16	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
21	..	..	·02	..	·02	..	·01	..	..	·02	·01	·02	·01	..	..	·01	·01	·01	..	·04	·04	·05	·03	·02	·02	·03
22	·17	·12	·11	·16	·11	..	·10	·02	·07	·09	·09	·10	·07	·05	·08	·09	·07	·08	·09	·12	·11	·10	·11	·08	·09	·09
23	·03	·04	·04	·04	·04	·02	·04	·10	..	·06	·04	·04	·04	·02	·02	·03	·05	·01	·05	·04	·04	·02	·03	·05	·04	·04
24	·26	·30	·28	·33	·31	·07	·24	..	·20	·20	·22	·11	·19	·14	·23	·16	·13	·18	·16	·13	·13	·18	·22	·21	·22	·31
25	·20	·08	·07	·22	·06	·11	·04	·24	·08	·03	·07	·08	·04	·02	·06	·12	·07	·06	·12	·07	·11	·07	·06	·08	·13	·14
26	·19	·20	·14	·23	·22	·04	·15	·16	·10	·09	·12	·10	·12	·03	·13	·17	·15	·11	·15	·06	·10	·08	·14	·13	·26	·14
27	·65	·68	·63	·61	·56	·34	·55	·24	·38	·36	·41	·40	·44	·33	·45	·38	·36	·40	·42	·31	·36	·38	·41	·40	·44	·50
28	·07	·08	·07	·08	·06	·41	·04	·54	·07	·05	·06	·06	·06	·04	·06	·05	·06	·05	·05	·05	·05	·05	·07	·05	·06	·06
*	1·66	1·61	1·49	1·84	1·47	1·06	1·42	1·49	1·03	·99	1·10	1·01	1·07	·67	1·06	1·09	·98	·94	1·11	·91	1·01	1·07	1·21	1·14	1·37	1·39
†	3·89	3·94	3·90	4·18	3·74	2·83	3·77	3·69	3·07	3·06	3·39	3·26	3·46	2·52	3·24	3·52	3·26	3·28	3·57	3·19	3·28	3·36	3·70	3·39	3·64	3·79

* The figure in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sideup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·08	·06	·04	·02	..	·02	·08	·08	·07	·07	·03
2	..	·02	..	..	..	..	..	..	·01	·02	..
3	..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..
7	·04	·03	·03	..	..	·01	·02	·02	..	·02	..
8	·01	..	..	..	..	..	..	..	..	..	..
9	..	·01	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..
11	..	·01	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..
15	·01	..	·02	·01	·02	..	·01	·01	..	·01	..
16	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..
21	..	·03	·02	·01	..	·02	·01	·01	·02	·04	..
22	·13	·10	·11	·12	·11	·10	·13	·10	·04	·11	·08
23	·03	·04	·06	·03	..	·08	·05	·05	·02	·05	·01
24	·25	·22	·24	·22	..	·26	·21	·18	·10	·23	·07
25	·13	·16	·14	·05	·30	·03	·15	·13	·09	·03	·12
26	·14	·17	·22	·14	·08	·17	·11	·07	·02	·10	·02
27	·48	·41	·67	·64	·67	·50	·43	·41	·37	·38	·28
28	·07	·07	·09	·07	·04	·06	·04	·03	·02	·07	·02
*	1·37	1·33	1·64	1·31	1·22	1·25	1·24	1·09	·76	1·13	·63
†	3·68	3·53	3·85	3·29	3·21	3·41	3·49	3·20	2·53	3·48	2·35

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(February, 1903.)

The month has been the warmest for February for a great many years. It was dry during the first three weeks, and very stormy and wet during the last week. The wet weather of the last week occasioned floods at Nutfield. The heavy gales on the 22nd and 27th caused much damage. At Sanderstead the observer reports that from the 22nd to the 28th there was a great deal of dust in the gauge, and at Upper Gatton the observer says that the slight rain on the 21st left a sandy deposit on the trees; there was, however, no deposit in the gauge on the morning of the 22nd, but on the morning of the 23rd the rain-water was thick. With reference to the warmth of the month, an observer at Croydon says that on the 21st the hawthorn was in leaf, frogs were spawning, the lesser celandine was abundant, and the male and female catkins of the sallow were in full bloom; and on the 28th the almond trees were in full bloom, and likewise the apricots on walls. The month has been fairly healthy, and diphtheria and scarlet fever cases seem to be diminishing. The rainfall is about four-tenths of an inch below the February average. The mean temperature of the month is nearly six degrees above the February average, and was at Croydon (Duppas House and Whitgift) 45°·1, at Worcester Park 45°, at Wallington 44°·7, at Warlingham 43°·3, and at Chipstead 43°·1. There were recorded at Wallington 92·1 hours of sunlight, which is 30 hours or eleven per cent. above the February average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxford rd.)	Redhill (Linkfd. la.)	Nutfield (old gauge)	Nutfield (new gauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·29	·21	·39	·34	·26	·37	·22	·29	·29	·23	·27	·29	·31	·30	·31	·30	·23	·19			·21	·25		·39	·37	·31
2	·49	·58	·47	·80	·58	·62	·44	·54	·51	·73	·77	·70	·75	·59	·74	·75	·68	·58			·79	·39		·61	·66	·52
3	·03	·06	·02	..	·06	·05	·06	·05	·03	·07	·04	·12	·10	·08	·09	..	..	·02			·18	·05		·04	·03	·03
4	·16	·10	·10	·15	·10	·11	·09	·10	·10	·06	·15	·11	·16	·06	·17	·22	·23	·15			·24	·12		·15	·11	·07
5	..	·23	·21	·22	·19	·17	·17	·16	·15	·20	·15	·16	·15	·24	·17	·07	·20	·16			·17	·18		·15	·14	·11
6	·10	·09	·20	·20	·02	·07	·04	·06	·06	·01	·06	·06	·07	·08	·07	·06	·03	·06			·02	·05		·08	·08	·06
7	·16	·15	·06	·10	·14	·10	·05	·04	·13	·13	·07	·09	·07	·09	·05	·05	·10	·06			·10	·05		·08	·07	·12
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	..
9	·21	·21	·25	·19	·13	·13	·12	·13	·10	·12	·17	·15	·17	·21	·15	·17	·13	·10			·04	·13		·21	·19	·11
10	·07	·12	·08	·08	·06	·06	·04	·04	·05	·06	·07	·05	·07	·09	..	·08	·11	·09			·13	·07		·09	·06	·04
11	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..			..	..		..	·01	..
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
14	..	..	·02	..	..	·02	..	..	·01	..	·01	..	..	..	·01	·03	·01	..			·03	·04		·03	·01	·01
15	..	..	..	..	..	..	..	·01	..	..	..	..	..	·01	..	..	·01	..			·02	·05		..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..			..	..		..	..	..
17	·71	·77	·66	·77	·59	·58	·34	·58	·47	·59	·73	·56	·64	·66	·57	·62	·59	·47			·47	·29		·63	·46	·40
18	·03	·02	..	..	..	..	·03	·02	·02	·01	·01	·02	..	..	..	·02	·01	..			·03	·03		..	·01	..
19	·05	..	..	·03	·05	·06	·04	·03	·02	·04	·02	·04	·03	·02	·05	·02	·05	·07			·06	·02		·05	·03	·01
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·02	..	..			..	..		..	..	..
21	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
23	·11	·13	·15	·17	·10	·11	·08	·08	·06	·10	·14	·11	·11	·13	·11	·14	..	·05			·09	·09		·17	·18	·15
24	·09	..	·01	..	·11	·11	·11	·11	·07	·13	·15	·11	·14	·06	·12	·09	·14	·02			·05	·03		·13	·06	·02
25	·16	·20	·14	·22	·13	·14	·13	·14	·19	·12	·14	·14	·15	·14	·15	·16	·14	·11			·10	·07		·15	·15	·13
26	·10	·08	·10	·06	·01	·03	·02	·02	·03	·02	·02	·01	·01	·02	..	..	·01	..			..	..		..	·01	..
27	·11	·11	·14	·18	·12	·13	·06	·10	·07	·09	·15	·11	·13	·09	·12	·11	·10	·09			..	·07		·12	·19	·12
28	·09	·11	·10	·10	·09	·11	·07	·09	·09	·08	·12	·09	·12	·12	·12	·18	·09	·09			·11	·09		·13	·11	·08
29	·21	·22	·19	·25	·26	·27	·25	·24	·28	·19	·18	·23	·18	·18	·18	·20	·18	·19			·22	·18		·16	·18	·15
30	·04	·09	·10	·15	·16	·23	·21	·21	·10	·17	·24	·19	·19	·14	·13	·15	·11	·08			·14	·11		·11	·11	·07
31	..	..	..	..	·05	..	..	..	..	..	..	..	..	..	..	..	..	·11			..	..		..	·01	..
*	3·21	3·48	3·39	4·01	3·21	3·47	2·57	3·04	2·74	3·16	3·66	3·34	3·55	3·32	3·31	3·44	3·15	2·69	3·05	1·78	3·20	2·36	2·57	3·48	3·23	2·51
†	8·29	8·58	8·35	9·02	7·60	8·06	6·68	7·30	7·11	7·50	8·65	7·88	8·15	8·03	8·42	7·82	7·82	7·09	8·16	5·08	7·72	6·24	7·04	8·46	7·78	6·53

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month.

† The totals from January 1st.

Daily Rainfall. *The 85 years (1816–1900) mean at Greenwich for March is 1·54 in.* **March, 1903.**

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farning-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·30	·22	·22	·35	·26	·21	·21	·31	·30	·27	·30	·30	·30	·26	·26	·25	·32	·34	·37	·36	·34	·33	·31	·23	·18
2		·54	·40	·36	·57	·35	·22	·35	·37	·39	·36	·40	·40	·40	·36	·41	·45	·49	·68	·60	·59	·47	·42	·45	·50	·40
3		·02	·01	·01	·02	·02	·01	..	·02	·03	·03	·03	·02	·03	·02	·02	·02	·03	·03	·03	·02	·04	·05	·03	·02	·04
4		·09	·10	·09	·12	·08	·07	·02	·08	·08	·07	·08	·07	·07	·07	·07	·05	·08	·08	·10	·06	·07	·08	·07	·06	·04
5		·18	·18	·16	·16	·13	·12	·15	·13	·12	·12	·12	·12	·12	·12	·12	·16	·13	·17	·14	·12	·13	·14	·12	·19	·18
6		·21	·10	·07	·07	·05	·08	..	·07	·07	·06	·11	·08	·08	·06	·07	·03	·08	·02	·07	·05	·07	·04	·04	·03	·02
7		·08	·12	·11	·18	·21	·10	·22	·20	·19	·16	·11	·15	·16	·17	·14	·19	·10	·19	·10	·12	·09	·05	·06	·10	·06
8		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9		·12	·08	·06	·17	·07	·04	..	·08	·08	·06	·06	·08	·07	·05	·07	·07	·10	·11	·12	·07	·05	·06	·03	·03	·01
10		·07	..	·05	·07	·06	·04	..	·05	·06	..	·06	·06	·06	·04	·05	·04	·04	·03	·04	·01	·02	·02	·01	·03	·03
11		..	..	..	..	..	..	..	·02	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14		..	·03	..	..	·01	..	..	..	..	·03	·02	..	·01	..	·01	·02	·02	·03	·03	·01	·02	..	..	·02	·02
15		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17		·53	·25	·27	·56	·27	·15	·21	·28	·31	·22	·28	·27	·32	·26	·29	·34	·38	·47	·48	·42	·39	·40	·40	·37	·19
18		..	·01	..	..	..	..	..	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	·01	..	..	..	..
19		·02	..	..	·01	·01	..	..	·02	·02	·02	·01	·01	·01	..	·01	·02	·02	·02	·02	·02	·02	·02	·01	·01	·01
20		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23		·19	·26	·29	·19	·22	·21	·18	·19	·19	·18	·20	·19	·20	·18	·20	·20	·18	·23	·19	·20	·19	·16	·16	·14	·09
24		·03	·01	..	·02	·02	·02	..	·02	·02	..	·02	·01	..	·01	·01	·02	·02	·06	·08	·05	·05	·08	·06	·04	·05
25		·22	·15	·17	·16	·18	·14	·16	·14	·13	·15	·12	·14	·14	·12	·14	·15	·14	·17	·15	·14	·12	·11	·10	·10	·10
26		·04	·03	·03	·01	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..	..	..	·03	·01	..	..	..
27		·16	·06	·05	·13	·06	·07	·05	·07	·08	·06	·08	·08	·07	·07	·08	·09	·10	·15	·17	·12	·09	·12	·10	·06	·04
28		·09	·13	·09	·07	·08	·07	·07	·08	·09	·07	·08	·06	·07	·07	·09	·09	·11	·13	·12	·11	·11	·10	·09	·07	·09
29		·20	·25	·25	·21	·18	·19	·15	·19	·20	·19	·21	·21	·20	·18	·20	·21	·17	·18	·16	·23	·17	·18	·14	·12	·09
30		·16	·09	·16	·10	·08	·08	·05	·08	·04	·04	·05	·05	·04	·03	·03	·04	·05	·08	·06	·06	·06	·06	·07	·13	·14
31		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	3·30	3·25	2·48	2·44	3·23	2·34	1·82	1·82	2·40	2·41	2·09	2·34	2·31	2·35	2·08	2·28	2·45	2·56	3·17	3·03	2·76	2·53	2·44	2·28	2·25	1·78
†	8·25	7·75	6·43	6·18	7·76	6·11	5·14	5·20	6·30	6·40	5·73	6·18	5·98	6·38	5·71	6·00	6·29	6·75	8·39	7·57	7·18	6·36	6·38	6·08	6·32	5·15

MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·31	·30	·25	·29	·25	·16	·29	·21	·23	·13	·14	·15	·18	·12	·19	·19	·19	·19	·23	·18	·15	·12	·15	·12	·18	·22
2	·35	·38	·35	·71	·31	·20	·28	·28	·13	·29	·31	·30	·22	·12	·28	·32	·32	·27	·37	·25	·27	·29	·28	·30	·21	·21
3	·03	·02	·03	·03	·02	·01	·01	·04	..	..	·02	·02	·02	·04	·02	·01	..	..	·03	·02	·02	..	..	·02	..	..
4	·04	·04	·05	·05	·06	..	·09	..	·08	·09	·07	·08	·09	·05	·08	·09	·09	·10	·11	·09	·09	·12	·10	·06	·08	·09
5	·13	·13	·12	·10	·11	·12	·13	·19	·09	·10	·15	·14	·13	·09	·13	·10	·10	·11	·13	·10	·11	·12	·13	·12	·11	·13
6	·04	·05	·05	·04	·07	..	·05	..	·14	..	·06	..	·05	·05	·06	·08	·09	·07	·07	·08	·06	..	·05	·03	·03	·03
7	·11	·14	·14	·09	·14	·15	·18	·19	·01	·10	·11	·07	·09	·07	·07	·06	·16	·11	·18	·15	·14	·15	·13	·08	·12	·13
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·04	..	..	..	..	..	..	..	..	..	..
9	..	·02	·03	·03	·03	·02	·04	..	..	·11	·06	·12	·12	·07	·07	·18	·17	·16	·15	·14	·12	·12	·14	·11	·07	·08
10	·01	·01	·01	·02	·02	·03	·05	·08	·03	·04	·10	·15	·05	·02	·04	·04	·02	·03	..	·04	·05	·04	·08	·05	·05	·07
11	..	..	..	..	..	·01	..	..	..	..	..	·04	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	·01	·01	..	·02	..	·02	·04	·10	·04	·03	·04	·02	..	·01	·02	·05	·06	·02	·01	·01	·01	·05
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	·01	·01	·01	·02	..	..	..	..	..	..	..	..	..	..	·02	·01	..
17	·26	·25	·19	·31	·23	·09	·19	·06	·09	·14	·14	·13	·13	·06	·16	·30	·15	·15	·19	·15	·13	·12	·14	·10	·15	·15
18	..	..	·01	·02	..	·06	..	·11	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	·01
19	..	·01	·01	·03	·01	..	..	..	..	..	·01	·04	..	..	..	..	·02	..	·01	·04	·05	·04	·02	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	·18	·19	·18	·16	·17	·12	·20	..	·20	·21	·21	·25	·22	·24	·20	·29	·29	·27	·33	·23	·24	·20	·24	·16	·21	·19
24	·03	·03	·02	·05	·02	·06	·03	·26	..	..	..	·04	..	·11	..	·04	·09	·03	·03	·06	·03	..	..	..	·02	·07
25	·09	·10	·11	·12	·13	·02	·13	..	·11	·10	·16	·10	·16	..	·16	·11	·07	·09	·12	·13	·16	·11	·12	·10	·09	·12
26	..	·01	..	·01	..	·10	..	·13	..	..	..	·07	·01	·02	..	·03	·04	..	·01	..	·01	..	..	·01	..	..
27	·08	·09	·09	·09	·10	·07	·11	·06	·06	·11	·17	·10	·16	..	·05	·05	·05	·16	·13	·06	·07	·12	·16	·12	·20	·14
28	·03	·10	·08	·11	·10	·09	·13	·08	·12	·17	·18	·16	·16	·30	·08	·22	·13	·33	·15	·11	·12	·17	·16	·15	·19	·13
29	·24	·23	·21	·20	·17	·02	·21	·02	·07	·20	·24	·23	·20	·14	·21	·19	·21	·20	·20	·21	·24	·25	·22	·20	·20	·23
30	·07	·07	·07	·06	·06	·14	·05	·20	·21	·03	·04	·03	·05	·06	·04	·06	·06	·04	·08	·03	·04	·06	·07	·03	·06	·08
31	..	..	..	..	..	..	..	·04	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	2·00	2·17	2·00	2·52	2·01	1·48	2·17	1·97	1·57	1·85	2·22	2·33	2·11	1·59	1·88	2·42	2·25	2·32	2·54	2·12	2·16	2·05	2·20	1·79	1·99	2·13
†	5·89	6·11	5·90	6·70	5·75	4·31	5·94	5·66	4·64	4·91	5·61	5·59	5·57	4·11	5·12	5·94	5·51	5·60	6·11	5·31	5·44	5·41	5·90	5·18	5·63	5·92

* The figures in this row give the totals for the month. † The totals from January 1st.

Daily Rainfall. **March, 1903.**

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·20	·18	·27	·18	·23	·23	·20	·18	·17	·12	·11
2	·19	·25	·30	·30	·21	..	·26	·24	·18	·27	·19
3	·01	·02	·03	·02	..	·01	·02	·03	..	..	..
4	·03	·07	·04	·03	·04	·05	·07	·05	·05	·07	..
5	·17	·13	·15	·16	·16	·12	·11	·09	·07	·11	·07
6	·06	·03	·04	·02	..	·02	·02	·02	·01	·01	·04
7	·11	·14	·15	·06	·04	·19	·17	·16	·12	·14	·11
8	..	..	..	..	..	..	..	..	..	..	..
9	·03	·09	·02	·01	..	·05	·13	·11	·08	·14	·12
10	·10	·06	·02	·02	·04	·02	·04	·03	·02	·05	·03
11	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..
14	..	·02	·01	..	..	..	..	·01	..	·01	..
15	..	..	..	..	..	..	..	..	..	..	..
16	..	·02	..	..	..	..	..	..	..	..	..
17	·12	·14	·21	·19	·11	·13	·12	·09	·05	·12	·08
18	..	..	..	..	..	..	..	..	..	..	..
19	..	·01	·02	·01	..	..	·05	·03	·01	·04	·03
20	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	·20	·20	·18	·14	·13	·16	·17	·18	·17	·22	·20
24	·05	·04	·06	·06	..	..	·04	·02	..	..	..
25	·10	·09	·10	·06	..	·06	·09	·08	·06	·10	·06
26	..	..	..	..	..	..	..	..	..	..	..
27	·19	·19	·12	·08	·21	·09	·17	·15	·14	·10	·02
28	·15	·17	·13	·10	·10	·15	·12	·11	·08	·16	·14
29	·21	·17	·22	·15	·22	·18	·24	·21	·13	·25	·16
30	·08	·08	·12	·16	·18	·14	·18	·14	·07	·07	·06
31	..	..	..	..	..	..	..	..	..	..	..
*	2·00	2·10	2·19	1·75	1·67	1·60	2·20	1·93	1·41	1·98	1·42
†	5·68	5·63	6·04	5·04	4·88	5·01	5·69	5·13	3·94	5·46	3·77

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(March, 1903.)

The month has been very warm, and also rather wet. The heat on the 25th was very unusual, and the hottest part of the day would seem to have occurred at about 8.30 p.m., and to have lasted till about 9 p.m. The month has been somewhat unhealthy, there being several cases of diphtheria and scarlet fever about. The month has been very stormy, and the gales have done a good deal of damage. There has been a remarkable absence of easterly winds. Vegetation is exceedingly forward. At Croydon the wood anemone was plentiful on the 14th, and standard pear trees were in full bloom on the 26th; at Sidcup the plum blossomed on the 7th, and the pear and cherry on the 24th; whilst at Nutfield peaches were in full bloom on the 12th, plums on wall on the 19th, and pears on wall on the 28th. The cuckoo was heard at Redhill on the 22nd, and a bat was seen at Croydon on the 4th. There was a sandy deposit in the rain gauge at Wallington on the 11th. The thunderstorm on the 25th seems to have been general throughout the district. Solar halos were seen at Greenwich on the 14th, 17th, and 25th, at Upper Gatton on the 4th and 25th, and at Wallington and Clapham Park on the 14th; and lunar halos were observed at Upper Gatton on the 7th, 12th, and 13th, at Greenwich and Beddington on the 12th and 13th, at Clapham Park on the 6th and 12th, and at Wallington on the 13th. The rainfall of the month is about thirty-four per cent. above the average. The mean temperature of the month is about 4°·7 above the average, and was at Croydon (Duppas House) 46°·6, at Worcester Park 46°·4, at Croydon (Whitgift) and Wallington 46°·3, at Warlingham 44°·4, and at Chipstead 44°·2. There were recorded at Wallington 165·2 hours of sunlight, which is 50·2 hours or fourteen per cent. above the March average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxford rd.)	Redhill (Linkfd. la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·19	·17	·20	·20	·18	·23	·22	·22	·11	·20	·18	·21	·19	·21	·23	·20	·20	·19			·16	·19		·21	·17	·16
2	·02	..	..	..	·04	·05	·04	·04	·01	·03	·03	·06	·04	·05	·05	·09	·01	·02			·06	·02		·04	·09	·11
3	·10	·10	·08	·10	·07	·07	·07	·06	·05	·08	·08	·09	·08	·08	·08	·13	·06	·06			·05	·03		·07	·07	·06
4	·10	·11	·12	·13	·12	·13	·12	·12	·04	·12	·12	·11	·10	·08	·11	·11	·13	·12			..	·08		·10	·07	·07
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..			..	..		..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	..
7	·01	·02	..	..	·03	·04	·03	·02	·03	·03	·02	·02	·01	..	..	·02	..	..			..	..		·02	·02	·03
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
11	..	..	..	..	·01	·01	·02	·03	·01	·03	..	..	..	..	..	..	·01	..			..	..		..	..	..
12	..	..	..	..	..	·02	..	..	·01	..	..	·01	..	..	..	·01	..	..			..	..		..	..	..
13	..	..	·01	..	..	..	..	..	·01	..	·02	·01	..	·01	..	..	..	..			..	..		..	..	..
14	·06	·02	·05	·05	·03	·05	·03	·03	·01	·03	·04	·03	·03	·03	..	·04	·02	·03			·03	·03		·04	..	·04
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
16	·02	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
20	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
25	·11	·30	·34	·31	·21	·22	·28	·25	·25	·24	·37	·35	·44	·37	·37	·40	·26	·35			·25	·30		·36	·28	·24
26	·86	·64	·50	·43	·67	·68	·68	·71	·57	·66	·73	·75	·70	·75	·69	·72	·77	·71			·67	·71		·67	·53	·40
27	·17	·12	·13	·15	·14	·14	·13	·13	·10	·13	·17	·14	·15	·14	·15	·10	·08	·11			·09	·06		·11	·11	·07
28	·50	·60	·62	·55	·39	·38	·43	·43	·46	·34	·47	·45	·49	·47	·47	·46	·48	·44			·52	·52		·50	·47	·42
29	·02	·04	·03	·07	·07	·07	·03	·03	·04	·06	·04	·03	·06	·05	·03	·05	·05	·07			·28	·05		·05	·05	·03
30	·42	·40	·52	·32	·17	·18	·22	·17	·14	·16	·21	·15	·18	·14	·15	·20	·41	·38			·06	·39		·23	·20	·19
*	2·58	2·54	2·60	2·31	2·13	2·27	2·30	2·24	1·85	2·11	2·48	2·41	2·47	2·38	2·33	2·54	2·48	2·48	2·28	1·85	2·17	2·38	2·10	2·40	2·07	1·82
†	10·87	11·12	10·95	11·33	9·73	10·33	8·98	9·54	8·96	9·61	11·13	10·29	10·62	10·41	10·75	10·36	10·30	9·57	10·44	6·93	9·89	8·62	9·14	10·86	9·85	8·35

MONTHLY GAUGE.

MONTHLY GAUGE.

MONTHLY GAUGE.

* The figures in this row give the totals for the month.

† The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wh.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·10	·20	·16	·19	·13	·12	·12	·12	·13	·13	·15	·15	·15	·15	·15	·16	·18	·21	·20	·15	·15	·17	·14	·18	·14
2		·05	..	..	·02	·04	·04	·04	·07	·07	·09	·10	·11	·15	·15	·14	·14	·06	·02	·05	..	·01	·01	·01	·03	·04
3		·08	·09	·08	·08	·08	·08	·07	·07	·08	·07	·07	·08	·08	·08	·07	·08	·07	·07	·06	·05	·07	·06	·04	·03	·05
4		·10	..	·06	·06	·04	·04	·03	·06	·04	·04	·04	·04	·04	·04	·04	·04	·06	·07	·07	·05	·08	·08	·08	·08	·08
5		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7		..	·01	·02	..	·01	·01	..	·01	·01	..	..	·02	·02	·01	·02	..	·01	·03	·01	..	..	..	..	..	..
8		..	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	·01	..	..	..
9		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11		·03	..	..	..	..	..	..	..	..	·02	·02	·01	..	·02	·02	·01	..	·03	·02	..	..	..	..	..	..
12		..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	·03	..	..	..	..	..	..	..	..	..
13		..	..	..	..	..	..	..	..	·01	..	..	..	·01	..	·01	..	·01	..	..	..	..	..	..	..	..
14		..	·06	·05	..	·04	·04	..	·04	·03	·03	·03	·03	·03	·04	·03	·03	·03	·04	·02	·03	·07	·05	·02	·04	·03
15		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..
17		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25		·30	·38	·36	·32	·29	·30	·17	·28	·26	·26	·16	·28	·32	·29	·27	·24	·28	·28	·30	·30	·31	·35	·21	·26	·23
26		·55	·44	·42	·48	·38	·37	·50	·42	·40	·38	·56	·40	·40	·37	·38	·48	·43	·52	·46	·45	·42	·41	·37	·44	·45
27		·16	·10	·12	·12	·04	·06	·08	·06	·06	·06	·06	·06	·07	·05	·05	·05	·06	·08	·07	·06	·05	·09	·06	·08	·07
28		·44	·53	·43	·52	·48	·51	·38	·41	·41	·37	·40	·38	·43	·39	·39	·39	·41	·43	·39	·45	·44	·35	·41	·39	·30
29		·07	·04	·02	·12	·03	·01	·07	·02	·04	·02	·02	·02	·04	·02	·03	·04	·03	·05	·02	·01	..	·09	·03	·04	·02
30		·20	·18	·19	·25	·14	·15	·11	·13	·11	·15	·16	·16	·20	·14	·17	·16	·21	·28	·25	·35	·33	·32	·25	·23	·20
*	2·10	2·08	2·03	1·91	2·18	1·70	1·73	1·57	1·69	1·65	1·62	1·77	1·74	1·96	1·75	1·77	1·85	1·85	2·11	1·92	1·90	1·93	1·99	1·62	1·81	1·61
†	10·35	9·83	8·46	8·09	9·94	7·81	6·87	6·77	7·99	8·05	7·35	7·95	7·72	8·34	7·46	7·77	8·14	8·60	10·50	9·49	9·08	8·29	8·37	7·70	8·13	6·76

MONTHLY GAUGE.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·16	·17	·16	·16	·15	·13	·21	·08	·11	·13	·16	·16	·15	·11	·13	·12	·13	·14	·16	·14	·14	·17	·19	·18	·20	·20
2	·01	·01	·02	·01	·02	·10	·16	·10	·04	·02	·03	·02	·03	..	·01	..	..	..	..	..	·02	·05	·11	·07	·13	·16
3	·07	·06	·07	·07	·07	..	·09	..	·03	·03	·08	·09	·09	·06	·07	·06	·05	·07	·07	·08	·08	·09	·10	·09	·09	·09
4	·08	·07	·06	·07	·07	·09	·08	·04	·08	·07	·06	·09	·05	·04	·04	·03	·04	·03	·05	·04	·05	·05	·07	·05	·05	·06
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	·04	·03	..	..	·01	..	·03	·02	..	·02	·02	·02	..	·02	·02	·03	·03	·04	·02	..	·03	·02	·03	·02
8	..	..	..	..	..	·01	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11	..	·01	..	..	..	..	..	..	..	·02	·02	..	·01	..	..	..	..	..	..	..	·02	..	..	..	..	..
12	..	..	..	..	·01	..	·01	..	..	..	·01	·01	..	..	·02	..	..	..	·02	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	..	..	..	..	·01	..
14	·15	·03	·05	·04	·05	..	·07	..	..	..	·04	·05	·04	·02	·03	·04	·04	·03	·03	·04	·07	·06	·02	·06	·05	·07
15	..	..	..	..	..	·06	..	·03	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	·01	..	..	..	..	..	..	..	·01	·01	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	·28	·29	·29	·26	·31	..	·33	..	·40	·34	·30	·36	·31	·25	·32	·32	·33	·33	·53	·36	·32	·40	·45	·33	·31	·16
26	·47	·52	·47	·47	·41	·57	·44	·41	·43	·34	·36	·36	·34	·30	·37	·34	·39	·35	·25	·39	·40	·29	·30	·34	·41	·64
27	·05	·03	·05	·05	·05	·17	·06	·29	·08	·10	·10	·10	·09	·07	·09	·09	·09	·09	·10	·10	·09	·08	·08	·09	·06	·06
28	·37	·39	·38	·60	·37	·13	·38	·07	·38	·42	·46	·48	·48	·33	·44	·47	·36	·35	·46	·46	·47	·42	·44	·39	·38	·42
29	·03	·02	·01	·03	·02	·23	·02	·44	..	·03	·06	·03	·03	·03	·03	·02	·05	·01	·01	..	·03	·04	·05	..	·02	·03
30	·23	·28	·38	·29	·30	·23	·22	·07	·12	·11	·15	·12	·13	·11	·14	·18	·26	·14	·24	·17	·12	·13	·16	·18	·17	·27
*	1·90	1·88	1·99	2·08	1·83	1·72	2·09	1·54	1·72	1·63	1·84	1·91	1·80	1·34	1·69	1·69	1·76	1·57	1·95	1·82	1·83	1·78	2·00	1·80	1·91	2·18
†	7·79	7·99	7·89	8·78	7·58	6·03	8·03	7·20	6·36	6·54	7·45	7·50	7·37	5·45	6·81	7·63	7·27	7·17	8·06	7·13	7·27	7·19	7·90	6·98	7·54	8·10

* The figures in this row give the totals for the month.

† The totals from January 1st.

Daily Rainfall. **April, 1903.**

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·18	·18	·21	·15	·16	·18	·16	·13	·10	·16	·10
2	·08	·07	·02	·01	·04	·02	·07	·06	·04	·11	·07
3	·09	·09	·07	·06	·06	·07	·09	·07	·05	·08	·06
4	·08	·07	·10	·12	·14	·10	·08	·09	·06	·07	·09
5	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..
7	·03	·02	..	..	..	..	·03	·01	..	·04	·04
8	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	·01	..	..	..	..
14	·02	·04	·05	..	..	·04	·04	·04	·01	·05	·03
15	·03	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..
25	·22	·30	·29	·25	·26	·27	·29	·25	·05	·26	·32
26	·53	·44	·57	·45	·56	·52	·42	·42	·60	·44	·26
27	·04	·07	·06	·06	·06	·04	·05	·05	·04	·07	·07
28	·41	·35	·37	·26	·32	·38	·39	·34	·33	·45	·36
29	·02	·02	·03	·02	·03	..	..	·01	·02	·05	·04
30	·31	·30	·24	·17	·19	·21	·24	·22	·30	·24	·20
*	2·04	1·95	2·01	1·55	1·82	1·83	1·87	1·69	1·60	2·02	1·64
†	7·72	7·58	8·05	6·59	6·70	6·84	7·56	6·82	5·54	7·48	5·41

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(April, 1903.)

The first four and the last six days were wet and warm, whilst the rest of the month was very cold, with sharp frosts, which did a great deal of damage to fruit trees and vegetation, pears, plums, and greengages having especially suffered, whilst the roses, clematis, horse chestnut, Ghent azaleas, magnolia, and walnut trees have been much blackened. There were snow showers generally in the district between the 11th and 16th. At Bromley, asparagus was cut on the 11th, a fortnight earlier than usual, and was then cut off by the frost. There have been several cases of small-pox and scarlet fever in the district. The cuckoo was heard at Upper Gatton on the 20th, and swallows were seen at Nutfield on the 25th. Solar halos were seen at Greenwich on the 6th and 24th, at Wallington on the 6th, and at Upper Gatton on the 20th; whilst at Clapham Park one was seen on the 6th with parhelia. The rainfall is about a quarter of an inch above the average. The mean temperature of the month is between two and three degrees below the average, and was at Croydon (Duppas House) 44°·8, at Worcester Park 44°·3, at Wallington 44°·0, at Chipstead 43°·6, and at Warlingham 42°·6. There were recorded at Wallington 153·2 hours of sunlight, which is 6·7 hours or one per cent. below the April average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·09	·21	·09	·15	·14	·10	·03	·04	·09	·09	·11	·06	·06	·16	·05	·05	·04	·05			·06	·04		·07	·03	·04
2	·50	·40	·54	·55	·23	·29	·24	·28	·32	·19	·28	·28	·30	·31	·36	·33	·24	·25			·31	·31		·36	·32	·30
3	·56	·82	·62	·68	·64	·58	·56	·58	·43	·65	·69	·72	·67	·76	·68	·64	·37	·31			·34	·36		·58	·50	·36
4	·04	·02	·03	·08	..	..	..	..	·03	..	..	·01	..	·03	..	·01	..	..			..	..		·03	·03	·03
5	·03	·48	..	..	..	·02	·01	·02	·40	..	·01	..	·01	..	..	..	·01	..			·02	..		·02	..	..
6	·94	·04	·59	·65	·69	·65	·55	·58	·01	·63	·60	·49	·52	·53	·50	·50	·31	·35			·01	·24		·42	·31	·23
7	..	·08	·06	·09	·03	·06	·01	·01	..	·01	·04	..	·03	·06	·01	·05	·03	·11			·21	·14		·04	·07	·04
8	..	..	..	..	..	..	..	..	..	..	..	·03	..	..	..	..	..	·02			·16	·10		..	..	..
9	·23	·12	·12	·06	·01	..	·03	·04	·01	..	..	..	..	..	..	·01	·01	·07			·09	·04		..	..	..
10	..	·03	·01	..	·07	·11	·27	·19	·03	·09	·12	·46	·21	·22	·47	·39	·14	·11			·07	·03		·36	·46	·47
11	·05	..	·04	·03	·03	·03	·04	·04	·01	·03	·04	·03	·03	·05	·05	·06	·05	·03			·06	..		·06	·08	·06
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
13	..	..	..	·03	..	·01	..	..	·01	·01	·01	..	·02	·03	..	..	..	..			..	..		·02	..	..
14	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..			..	·01		..	·02	..
15	..	..	..	..	·02	·04	..	..	..	..	..	·04	·01	·01	·03	·04	..	..			·01	..		·04	..	..
16	·27	·11	·36	·42	·30	·30	·35	·40	·01	·30	·31	·34	·33	·37	·41	·38	·31	·32			·36	·32		·46	·31	·32
17	·19	·45	·12	·25	·18	·19	·15	·14	·38	·18	·24	·21	·21	·19	·17	·20	·17	·19			·16	·21		·16	·16	·12
18	..	..	..	..	..	..	..	..	·23	..	..	..	..	..	..	·01	..	..			..	..		..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	..	..	·02	·02	..	..	·01	·01	..	..	..	·01	..	·01	..	·05	..	..			·01	·04		..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
28	·09	·13	·19	·19	·21	·21	·25	·25	·14	·18	·28	·24	·24	·22	·25	·22	·36	·38			·43	·47		·31	·34	·29
29	·07	..	·05	..	·03	·04	·04	·05	..	·03	·03	·02	·03	·03	·02	·03	·03	..			..	..		·04	..	·03
30	·60	·56	·64	1·02	·17	·16	·21	·23	·30	·14	·33	·26	·27	·22	·16	·16	·36	·32			·04	·05		·59	·65	1·20
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
*	3·66	3·45	3·48	4·22	2·75	2·80	2·75	2·86	2·40	2·53	3·09	3·20	2·94	3·20	3·16	3·13	2·43	2·51	2·35	2·00	2·34	2·36	2·62	3·56	3·28	3·49
†	14·53	14·57	14·43	15·55	12·48	13·13	11·73	12·40	11·36	12·14	14·22	13·49	13·56	13·61	13·91	13·49	12·73	12·08	12·79	8·93	12·23	10·98	11·76	14·42	13·13	11·84

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·24	·18	·19	·19	·11	·10	·08	·10	·08	·07	·06	·07	·08	·06	·06	·09	·08	·06	·05	·04	·04	·04	·03	·03	·03
2		·39	·31	·28	·29	·22	·22	·18	·24	·26	·25	·25	·26	·32	·23	·27	·21	·28	·27	·35	·31	·26	·27	·23	·16	·15
3		·70	·53	·40	·60	·34	·28	·32	·36	·32	·28	·32	·30	·27	·24	·25	·29	·29	·34	·33	·30	·25	·28	·26	·17	·28
4		·04	·07	·05	..	·01	·01	·03	·02	·04	·03	·03	·02	·04	·02	·02	·04	·03	·01	·01	..	..	·01	..	..	..
5		·02	·11	·20	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..
6		·39	·46	·42	·42	·24	·22	·21	·22	·19	..	·20	·21	·20	·18	·24	·21	·22	·26	·27	·23	·20	·18	·16	·33	·15
7		·03	·12	·10	·09	..	·23	·27	·08	·05	·20	·06	·06	·04	·04	·09	·10	·05	·05	·03	·05	·07	·01	..	·07	·01
8		..	..	..	..	..	..	..	..	..	..	..	..	·08	..	..	·01	..	·01	..	·01	·02	·03	·03	·19	·29
9		·01	·30	·14	..	..	..	·04	..	..	·02	..	..	..	·11	·01	·05	·04	·05	·02	·11	·08	·01	·05	·07	·27
10		·03	·04	·02	·34	·34	·38	·33	·40	·38	·35	·38	·38	·43	·41	·40	·41	·34	·32	·24	·27	·31	·15	·12	·01	·02
11		·04	·05	·01	·07	·04	·05	·05	·04	·05	·03	·04	·04	·04	·03	·06	·07	·07	·09	·05	·04	·05	·05	·07	·12	·11
12		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01
13		·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..
16		·33	·40	·37	·41	·34	·34	·33	·41	·41	·42	·40	·37	·37	·44	·33	·31	·35	·30	·33	·33	·34	·34	·35	·33	·31
17		·24	·18	·21	·12	·13	·14	·08	·14	·18	·12	·12	·12	·12	·12	·12	·18	·13	·19	·14	·15	·16	·15	·24	·13	·25
18		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
19		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22		·03	..	·05	..	·04	·02	·04	·02	·02	·02	·01	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	·01
23		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27		..	..	..	..	..	..	..	..	·01	..	·01	·02	·02	·01	·01	·02	·01	..	..	..	..	..	..	..	..	..
28		·19	·20	·18	·28	·21	·19	..	·21	·17	·16	·16	·16	·17	·14	·15	·16	·23	·22	·27	·23	·22	·23	·19	·30	·11
29		·02	..	·02	·01	·02	·02	·05	·02	·04	..	·04	·03	·03	·02	·02	·03	·03	·04	·02	..	·01	·01	..	·02	·03
30		·43	·30	·28	·34	·45	·38	1·50	3·13	2·29	1·32	1·85	1·85	1·46	1·60	1·32	·72	·71	·10	·07	·19	·20	·28	·20	·03	·05
31		..	..	..	..	..	..	..	..	..	..	..	..	·10	..	..	..	..	..	..	..	..	..	..	..	..	..
*	3·45	3·15	3·25	2·92	3·16	2·49	2·58	3·47	5·39	4·49	3·27	3·93	3·89	3·77	3·66	3·35	2·92	2·86	2·31	2·18	2·26	2·21	2·04	1·93	1·97	2·08
†	13·80	12·98	11·71	11·01	13·10	10·30	9·45	10·24	13·38	12·54	10·62	11·88	11·61	12·11	11·12	11·12	11·06	11·46	12·81	11·67	11·34	10·50	10·41	9·63	10·10	8·84

MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·05	·04	·04	·05	·07	·07	·08	·13	·12	·05	·10	·13	·12	·10	·10	·17	·10	·11	·12	·10	·13	·08	·06	·03	·05	·09
2	·20	·23	·20	·23	·23	..	·23	..	·05	·13	·21	·18	·19	·13	·18	·18	·18	·17	·18	·14	·16	·18	·20	·22	·21	·26
3	·17	·19	·20	·23	·17	·29	·21	·36	·07	·14	·23	·26	·20	·13	·23	·35	·36	·25	·28	·40	·30	·22	·26	·20	·21	·18
4	..	·01	..	·01	·01	·04	·02	·02	·09	·02	·02	·03	·03	·01	·02	·04	·04	..	·02	·02	·03	·01	·01	·02	·01	·03
5	..	..	..	..	..	·02	..	..	·22	·12	·13	·25	·10	·10	·18	·16	·08	·16	·24	·10	·26	·11	·15	·14	·05	·03
6	·36	·40	·35	·22	·30	·06	·27	..	·02	·15	·12	·12	·12	·12	·19	·17	·11	·15	·09	·09	·15	·27	·28	·27	·29	·38
7	·06	·11	·10	·07	·10	·30	·22	·45	·05	·25	·17	·13	·15	·05	·08	·09	·12	·05	·17	·32	·15	·26	·15	·01	·11	·15
8	·03	·02	·03	·03	·02	..	..	..	·01	..	..	·01	·01	..	..	·01	..	..	..	..	·01	..	..	..	..	..
9	·04	·16	·22	·05	·48	·26	·35	·23	·03	·36	·51	·30	·50	·03	..	·02	·03	..	·08	·05	·15	·22	·25	·35	·44	·18
10	·09	·18	·30	·22	·50	..	·39	..	·05	·35	·31	·43	·33	·22	·20	·02	·02	·08	·13	·26	·26	·31	·38	·34	·36	·46
11	·04	·05	·07	·05	·07	·43	·05	·45	·34	·04	·06	·03	·06	·02	·05	·03	·02	·01	·02	·04	·02	·03	·06	·06	·04	·05
12	..	..	..	..	..	·01	..	·03	·06	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	·15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	·07	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	·09	..	·01	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..
16	·30	31	·31	·35	·30	·06	·39	·05	·34	·24	·23	·25	·25	·18	·32	·20	·20	·21	·29	·24	·23	·24	·30	·23	·31	·31
17	·13	·16	·16	·15	·20	·28	·18	·46	·08	·16	·10	·12	·10	·06	·15	·06	·15	·13	·08	·09	·12	·09	·15	·11	·16	·18
18	..	..	..	..	·01	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	·01	..	·01	·03	·02	..	·03	..	·03	..	·02	..	·01	·03	..	·01	·04	·02	·01	·02
23	..	..	..	..	..	..	..	·03	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	..	·02	·03	·01	·03	..	..	..	..	..	..	..	·01	..	·02	..	..	..	..	..	..	..	..	·02	·04	·02
28	·20	·20	·17	·16	·15	·12	·21	·18	·17	·18	·21	·28	·27	·20	·25	·22	·19	·25	·28	·41	·24	·19	·21	·21	·22	·19
29	..	..	·01	..	·02	..	·06	..	·03	·05	·03	·03	·02	..	·01	·02	·01	·01	·01	·01	·04	·03	·05	·04	·05	·03
30	·27	·39	·37	·19	·35	·04	·37	3·67	1·15	2·26	·25	·48	·20	·42	·41	·18	·22	·13	·13	1·34	1·13	1·82	·73	1·14	·55	·23
31	..	..	..	..	..	·34	..	·08	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	1·95	2·47	2·56	2·02	3·01	2·33	3·04	6·14	3·20	4·54	2·71	3·04	2·70	1·77	2·42	1·92	1·85	1·71	2·14	3·64	3·38	4·07	3·28	3·41	3·11	2·79
†	9·74	10·46	10·45	10·80	10·59	8·36	11·07	13·34	9·56	11·08	10·16	10·54	10·07	7·22	9·23	9·55	9·12	8·88	10·20	10·77	10·65	11·26	11·18	10·39	10·65	10·89

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·06	·05	·04	·01	..	·07	·04	·03	·05	·06	·06
2	·20	·17	·20	·12	..	·16	·18	·14	·14	·16	·16
3	·17	·16	·18	·12	·17	·21	·21	·20	·18	·32	·25
4	·02	·01	·02	..	·02	..	·01	·01	·02	·03	·01
5	·01	·02	..	..	..	..	·02	·03	·05	·24	·17
6	·29	·28	·23	·11	·14	·21	·13	·14	·17	·18	·15
7	·15	·10	·08	·02	..	·12	·10	·07	·06	·24	·33
8	·02	·01	·06	·22	·23	·03	·01	·02	·01	..	..
9	·16	·14	·33	·32	·22	·22	·13	·25	·11	·31	·24
10	·45	·41	·04	·01	·02	·03	·05	·21	·29	·30	·35
11	·08	·09	·06	·04	..	·10	·09	·05	·10	·05	·01
12	..	..	..	..	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..
16	·34	·34	·33	·31	·15	·38	·34	·29	·24	·23	·23
17	·17	·16	·19	·20	·51	·15	·16	·13	·14	·12	·15
18	..	..	..	..	..	..	..	..	·01	..	..
19	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	..	·02	..	..	..	..	·01	·01	..	·03	..
23	..	..	·01	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..	..	..	..	..
27	·03	·02	·05	..	..	·02	..	..	..	..	..
28	·21	·22	·29	·14	..	·27	·32	·28	·32	·31	·30
29	·02	·02	·01	·02	·13	..	..	..	·02	·05	·03
30	·21	·20	·06	..	·08	·06	·13	·15	·11	·61	·44
31	..	..	..	..	..	..	..	..	..	..	..
*	2·59	2·42	2·18	1·64	1·67	2·03	1·93	2·01	2·02	3·24	2·88
†	10·31	10·00	10·23	8·23	8·37	8·87	9·49	8·83	7·56	10·72	8·29

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(May, 1903.)

The month has been extremely wet during the first ten days, and then again on the 16th and 17th, and again on the 28th, 29th, and 30th. The fall is above the average of the ten years (1891–1900) at every station; in some cases more than three times. Though thunderstorms were experienced throughout the district on the 9th, 17th, 28th, 30th, and 31st, the only ones that may be worth noticing are those on the 30th and 31st, which were most severe. In the storm on the 30th, 3½ in. of rain fell in just under the hour at Beddington Corner, and at Wallington 2·77 in. fell in sixty-five minutes, and at Croydon (Duppas House) eight-tenths of an inch fell in fifteen minutes, and at Croydon (Windmill Road) 1·45 in. fell in one hour. The damage done has been very great in the district round Croydon, where this storm was centred. The storm in the early morning of the 31st was not so bad, though the lightning and thunder were incessant. Several houses were struck by lightning in the storm on the 30th, and some people were killed. This storm was also accompanied by hail of large-sized pieces of ice. The month has been fairly healthy, though scarlet fever and diphtheria have been somewhat prevalent in places. The month has been warm, and the mean temperature is about one degree above the average, and was at Croydon (Duppas House) 54°·6, at Worcester Park 54°·0, at Croydon (Whitgift) 53°·7, at Wallington 53°·6, at Chipstead 53°·5, and at Warlingham 51°·7. There were recorded at Wallington 189·5 hours of sunlight, which is 11·1 hours or three per cent. below the May average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·03	..	·03	..	·01	·01	·03	·03	·01	·01	·01	..	·01	·03	·03	·03	..	..			·35	·01		·01	·03	·02
2	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
8	·35	·35	·33	·35	·46	·46	·42	·40	·30	·42	·41	·47	·40	·45	·44	·45	·54	·48			·47	·53		·47	·44	·47
9	·24	·30	·29	·30	·28	·29	·34	·37	·25	·24	·34	·29	·26	·32	·33	·32	·24	·35			·39	·45		·28	·26	·23
10	·64	·64	·67	·75	·80	·82	·76	·74	·79	1·00	1·04	1·12	1·13	1·33	1·15	1·21	1·09	·90			1·23	1·07		1·52	1·70	1·75
11	·83	·94	·88	1·07	·96	·99	·99	1·01	·93	·89	·85	·95	·88	1·05	1·02	1·05	·92	·96			·91	·82		·96	·95	·82
12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
13	·89	·87	·88	1·04	·73	·74	·72	·77	·73	·74	·74	·78	·76	·83	·93	·88	·76	·82			·94	·86		·89	·99	·92
14	·21	·27	·41	·65	·83	·87	·78	·75	·44	·91	1·06	·90	1·00	1·07	1·04	·98	·86	·86			·87	·81		·95	·81	·80
15	·62	·54	·56	·47	·43	·43	·45	·39	·43	·48	·47	·40	·46	·50	·51	·47	·31	·26			·34	·24		·48	·53	·53
16	·03	·02	·02	·04	·11	·10	·14	·11	·05	·09	·04	·09	·05	·04	·07	·17	·04	·18			·18	·14		·26	·09	·21
17	..	..	..	·15	·17	·17	·16	·17	·08	·20	·16	·17	·15	·21	·22	·18	·09	·08			·23	·12		·15	·12	·27
18	·08	·04	·11	·09	·02	·07	·05	·05	·06	·01	·04	·04	·02	·05	·03	·05	·05	·15			·01	·22		..	·03	·02
19	·82	1·00	1·01	·80	·61	·57	·47	·46	·46	·62	·70	·47	·50	·62	·53	·60	·66	·51			·68	·28		·74	·64	·86
20	..	..	..	..	·01	·01	·01	..	..	·02	·02	·02	·01	·04	·02	·04	·02	..			..	..		·03	·03	·02
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
28	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
*	4·74	4·97	5·19	5·71	5·43	5·53	5·32	5·25	4·53	5·63	5·88	5·70	5·63	6·54	6·32	6·43	5·58	5·55	6·05	6·00	6·60	5·55	6·79	6·74	6·62	6·92
†	19·27	19·54	19·62	21·26	17·91	18·66	17·05	17·65	15·89	17·77	20·10	19·19	19·19	20·15	20·23	19·92	18·31	17·63	18·84	14·93	18·83	16·53	18·55	21·16	19·75	18·76

MONTHLY GAUGE. (Knockholt (field gau.))

MONTHLY GAUGE. (Knockholt (tower ga.))

MONTHLY GAUGE. (Chelsham)

* The figures in this row give the totals for the month.

† The totals from January 1st.

Day of Mo.	Biygh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·02	..	..	..	·05	·02	..	·02	·02	..	·01	·02	·01	..	..	..	·02	..	·05	..	..	..	..	..	·01
2		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8		·47	·46	·43	·43	·47	·51	·50	·53	·52	·49	·50	·46	·52	·49	·45	·48	·46	·53	·47	·54	·47	·45	·44	·55	·54
9		·36	·30	·30	·27	·27	·28	·30	·25	·26	·25	·28	·27	·30	·27	·27	·25	·30	·31	·29	·35	·31	·33	·26	·21	·23
10		1·11	1·77	1·63	1·86	1·74	1·75	3·17	1·82	1·76	1·78	1·85	1·72	1·75	1·75	1·75	1·74	1·59	1·81	1·67	1·25	1·58	1·48	1·40	·95	·30
11		·73	·83	·71	·90	·70	·66	·69	·82	·75	·72	·82	·74	·74	·62	·75	·82	·86	·95	·87	·90	·86	·89	·82	·80	·63
12		..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13		·86	·95	·98	·96	·91	·87	1·40	1·04	·99	1·08	1·12	1·09	1·10	1·05	1·20	1·22	·90	1·06	·91	1·02	1·06	·90	·86	·90	1·00
14		1·11	·76	·66	·76	·76	·88	1·01	·84	·92	1·88	1·10	·94	·93	·92	·86	·82	·88	1·03	·83	·95	·95	·82	·87	·88	·93
15		·56	·62	·63	·57	·62	·61	·66	·68	·68	·68	·78	·75	·77	·70	·75	·84	·58	·77	·50	·62	·57	·49	·46	·52	·51
16		·10	·11	·09	·09	·25	·35	·30	·17	·20	·29	·20	·23	·32	·39	·39	·35	·21	·41	·34	·50	·43	·02	·02	·04	·02
17		·18	·28	·25	·18	·25	·25	·25	·21	·20	·21	·22	·21	·24	·29	·27	·28	·25	·26	·19	·25	·23	·21	·25	·46	·40
18		·02	·03	·02	·06	·01	..	·03	·01	·01	..	·01	·01	·02	·02	·01	·01	·04	·01	·04	..	·03	·18	·04	·04	..
19		·85	·80	·80	·68	·62	·58	·60	·69	·71	·72	·86	·76	·74	·76	·80	·79	·81	·86	·72	·90	·89	·60	·76	·86	·69
20		·01	..	..	·01	·01	..	..	·01	·01	..	·01	..	·01	·01	·01	·02	·02	·04	·01	..	·01	·01	..	..	·02
21		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
28		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
29		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	7·00	6·38	6·91	6·50	6·77	6·67	6·76	8·91	7·09	7·03	8·10	7·76	7·20	7·45	7·27	7·51	7·62	6·92	8·04	6·89	7·28	7·39	6·38	6·18	6·21	5·28
†	20·80	19·36	18·62	17·51	19·87	16·97	16·21	19·15	20 47	19·57	18·72	19·64	18·81	19·56	18·39	18·63	18·68	18·38	20·85	18·56	18·62	17·89	16·79	15·81	16·31	14·12

MONTHLY GAUGE.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Haynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	·03	·01	..	..	..	..	·03	·01	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	·48	·50	·45	·44	·41	·49	·50	..	·51	·57	·61	·59	·57	·50	·47	·45	·47	·56	·60	·53	·60	·67	·61	·54	·56	·54
9	·20	·21	·23	·22	·26	·75	·31	·54	·38	·26	·26	·26	·27	·22	·26	·28	·26	·28	·31	·24	·25	·24	·23	·25	·25	·25
10	·97	1·15	1·30	1·45	1·22	·61	1·37	·85	·94	1·03	1·24	1·17	1·34	1·33	1·82	1·62	1·56	1·60	1·42	1·01	1·19	1·10	·96	·95	1·11	1·16
11	·70	·63	·59	·69	·52	·02	·48	1·79	·60	·36	·44	·33	·42	·44	·64	·49	·49	·55	·44	·23	·29	·33	·37	·34	·37	·42
12	..	..	..	..	..	..	..	·07	·57	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	1·10	1·20	1·10	1·04	1·06	·47	·95	·50	·04	·79	·77	·84	·79	1·04	·90	·83	·87	·95	1·24	1·55	·94	1·00	·93	·87	·87	·95
14	1·06	1·10	1·03	·69	1·02	·59	·98	·54	·83	·95	·88	·93	·83	·69	·82	·94	·81	·83	·89	1·03	1·04	1·05	1·06	·99	1·00	1·01
15	·62	·71	·70	·60	·68	1·40	·74	1·38	·92	·66	·69	·73	·70	·61	·70	·71	·72	·71	·76	·65	·73	·81	·77	·70	·73	·69
16	·20	·13	·20	·11	·52	·12	·42	·37	·21	·15	·27	·43	·23	·10	·19	·15	·25	·10	·11	·26	·39	·20	·10	·24	·37	·28
17	·34	·31	·26	·20	·24	·23	·25	·29	·29	·30	·25	·32	·27	·32	·25	·25	·36	·27	·27	·33	·38	·44	·49	·40	·50	·40
18	·03	·02	·02	·02	·02	..	·01	·02	·10	..	..	·01	·01	·01	·02	·02	·01	..	..	·01	·02	..	..	..	·03	·02
19	·89	·96	·93	·83	·85	·32	·89	·60	·64	·65	·67	·73	·69	·63	·74	·61	·83	·79	·74	·70	·74	·68	·80	·68	·76	·92
20	..	..	..	..	·01	..	·01	·10	·01	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	·02
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	6·59	6·92	6·81	6·29	6·84	5·00	6·91	7·05	6·06	5·74	6·08	6·35	6·12	5·89	6·84	6·36	6·63	6·64	6·78	6·54	6·57	6·52	6·32	5·96	6·55	6·66
†	16·33	17·38	17·26	17·09	17·43	13·36	17·98	20·39	15·62	16·82	16·24	16·89	16·19	13·11	16·07	15·91	15·75	15·52	16·98	17·31	17·22	17·78	17·50	16·35	17·20	17·55

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	N.
1	..	..	..	·01	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..
8	·51	·43	·45	·49	·53	·48	·57	·58	·45	·58	·52
9	·25	·24	·21	·22	·25	·27	·26	·24	·25	·20	·24
10	·75	·69	·85	·44	·45	·65	·52	·51	·57	·80	·68
11	·38	·36	·60	·64	·58	·47	·41	·39	·35	·30	·17
12	..	..	..	..	..	..	..	..	..	..	..
13	·97	·94	·91	·80	·87	·90	·99	·99	·90	1·03	·94
14	1·12	1·17	·96	·95	1·24	1·20	1·18	1·17	1·22	1·15	1·10
15	·71	·75	·66	·60	·55	·73	·71	·65	·55	·76	·67
16	·19	·11	·22	·06	·08	·09	·30	·13	·11	·09	·04
17	·41	·59	·41	·42	·43	·34	·32	·32	·42	·46	·32
18	·02	·01	·02	·09	..	·01	·01	..	..	..	..
19	·81	·79	·87	·62	·73	·82	·81	·76	·75	·80	·50
20	..	..	..	·02	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..	..	..	..	..
29	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..
*	6·12	6·08	6·16	5·36	5·71	5·96	6·08	5·74	5·57	6·17	5·18
†	16·43	16·08	16·39	13·59	14·08	14·83	15·57	14·57	13·13	16·89	13·47

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(June, 1903.)

The month has been a most remarkable one. It is certainly the wettest, if not the coldest June, so far as the records of the district are concerned. But what is even more remarkable is the large quantity of rain which fell in the short space of twelve days between the 8th and the 20th. This rain had not the characteristics of thunderstorm rains, but rather of winter rains. The low temperatures and the wet have been prejudicial to all crops, some of which have been totally destroyed, but has not affected the health of the people so much as might have been expected. Scarlet fever cases, though not numerous, seem to be spread over a large area. Ground frosts have been reported in some places. The observer at Sanderstead mentions that on the evening of the 8th there was a remarkable orange-red moon through a sort of high fog. The observer at Sidcup says that the 19th was the coldest day in June in his record commencing in 1874, with a maximum in shade of 49°, and a minimum in shade of 46°; and the observer at Abinger Hall mentions a remarkable sunset on the evening of the 28th. Thunder was heard on the 1st, 16th, and 25th at Nutfield; on the 10th at Sidcup; on the 16th at Abinger; on the 16th and 17th at Upper Gatton, Beddington, and Greenwich; and on the 17th at Wallington and Clapham. And solar halos were seen on the 2nd at Upper Gatton; on the 26th and 28th at Clapham; and on the 28th at Wallington. The mean temperature of the month is about 3½° below the average, and was at Clapham Park 58°·2, at Chipstead 57°·8, at Croydon (Duppas House) 56°·3, at Worcester Park 56°·2, at Wallington 55°·7, and at Warlingham 54°·6. There were recorded at Wallington 174·1 hours of sunlight, which is 31·9 hours or seven per cent. below the June average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Bst.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
5	·03	..	·02	·03	·03	*·03*	·03	·03	·01	·03	·04	·03	·03	·02	..	·04	·04	·06			..	·05		·04	·03	·02
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
12	..	..	·02	..	..	..	..	..	·01	..	·01	..	·01	·01	..	·01	..	..			..	..		·02	·01	·01
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
14	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
16	·11	·05	·06	·09	·06	*·08*	·08	·07	·04	·06	·07	·06	·07	·09	·08	·05	·09	·15			·15	·07		·07	·04	·06
17	·20	·10	·22	·20	·09	*·08*	·14	·12	·06	·16	·20	·45	·16	·25	·28	·56	·82	·53			·29	1·02		·83	·50	·44
18	·11	·50	·61	·67	·10	*·12*	·10	·08	·15	·11	·16	·10	·14	·32	·48	·44	·07	·05			·35	·02		·19	·13	·10
19	·40	·50	·60	·55	·68	*·72*	1·48	1·71	·68	·49	·30	·29	·26	·35	·22	·16	·30	·57			·84	·93		·10	·10	·06
20	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..			..	..		..	·01	·02
21	·06	·04	·03	·05	·02	*·04*	·03	·03	·01	·03	·04	·03	·02	·01	·02	·02	·02	·01			·04	·06		·03	·03	·05
22	..	..	..	..	..	..	·03	·03	·01	·01	..	..	..	..	·02	·03	·02	·04			·05	·03		·02	..	..
23	1·19	1·15	1·02	·95	·88	*·93*	·92	·93	1·05	·91	·98	1·16	·91	1·06	1·04	1·18	2·01	2·20			2·39	2·15		1·24	1·22	1·47
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			·02	..		·01	..	..
25	·89	·67	·68	·80	·43	*·48*	·46	·42	·60	·42	·83	·55	·79	·80	·59	·60	·39	·39			·32	·41		·62	·49	·42
26	·20	·29	·19	·07	·21	*·20*	·15	·13	·04	·28	·14	·07	·11	·14	·10	·13	·23	·15			·33	·18		·16	·19	·20
27	·34	·39	·37	·32	·24	*·24*	·21	·21	·21	·20	·28	·20	·23	·35	·24	·26	·22	·21			·18	·21		·24	·20	·18
28	·44	·31	·39	·43	·34	*·37*	·40	·38	·32	·37	·32	·38	·33	·35	·35	·35	·40	·39			·44	·56		·34	·36	·34
29	·22	·26	·22	·25	·62	*·69*	·36	·39	·19	1·10	·78	·80	·62	·64	·55	·20	·57	·34			·59	·38		·72	·72	·53
30	..	·02	·02	..	·02	*·04*	·02	·01	·01	·02	·03	·04	·06	·04	·04	·02	·03	·02			·06	·09		·05	·04	·05
31	·02	..	..	·04	·04	*·04*	·04	·04	·04	·03	·03	·02	·02	·03	·02	..	..	..			·01	·01		..	..	·01
*	4·21	4·28	4·45	4·45	3·76	*4·06*	4·45	4·58	3·45	4·22	4·21	4·18	3·76	4·46	4·03	4·09	5·21	5·11	4·75	3·94	6·06	6·17	4·77	4·68	4·07	3·96
†	23·48	23·82	24·07	25·71	21·67	*22·72*	21·50	22·23	19·34	21·99	24·31	23·37	22·95	24·61	24·26	24·01	23·52	22·74	23·59	18·87	24·89	22·70	23·32	25·84	23·82	22·72

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5		..	..	..	·03	·01	·01	..	·01	·01	·02	·01	·02	·01	..	·01	·02	·04	·02	·02	..	..	..	..	·01	·01
6		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12		·02	..	..	..	..	..	..	·01	..	..	·01	·02	·02	..	·02	·02	·02	·02	·01	..	..	·02	..	·02	·02
13		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01
15		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16		..	·06	..	·07	·04	·04	..	·05	·05	..	·04	·05	·05	·05	·05	·06	·06	·05	·07	·03	·09	·03	·03	·04	·02
17		·45	·36	·36	·05	·58	·80	·70	·62	·61	·76	·87	·71	·85	·85	·64	·59	·69	·43	·47	·75	·92	·68	·91	·60	·88
18		·34	·38	·27	1·00	·14	·23	·01	·10	·08	·08	·07	·07	·08	·06	·07	·10	·08	·18	·06	·07	·06	·02	·01	·01	·02
19		1·61	·15	·26	·16	·07	·13	·10	·08	·07	·07	·07	·07	·07	·08	·06	·06	·05	·06	·05	·01	·04	·04	·03	·21	·19
20		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·02	..
21		·03	·05	·05	·04	·06	·04	·03	·06	·04	·04	·04	·04	·04	·03	·04	·04	·07	·08	·05	·05	·05	·05	·04	·05	·02
22		..	·04	..	..	..	..	..	..	..	..	..	·01	..	..	..	·01	·02	·01	·01	..	..	·01	·02	·04	·01
23		·94	·98	·88	1·11	1·15	1·18	1·17	1·34	1·38	1·40	1·53	1·41	1·40	1·41	1·46	1·56	1·55	1·68	1·58	1·81	2·45	2·63	3·16	3·78	3·54
24		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	·01	..	·01	·01
25		·77	·63	·68	1·14	·80	·72	·85	·64	·54	·43	·42	·42	·40	·39	·35	·27	·41	·34	·50	·38	·50	·51	·36	·28	·22
26		·08	·70	·52	·05	·48	·65	·30	·55	·52	·66	·44	·43	·45	·60	·30	·45	·27	·40	·19	·29	·16	·20	·17	·20	·36
27		·19	·10	·09	·12	·11	·09	·12	·16	·15	·11	·12	·15	·18	·11	·12	·13	·15	·16	·22	·20	·20	·22	·16	·13	·10
28		·38	·38	·30	·47	·29	·27	·35	·37	·34	·30	·34	·34	·60	·31	·76	·31	·39	·40	·35	·45	·42	·32	·28	·32	·60
29		·58	·35	·38	·99	·51	·59	·50	·62	·58	·56	·51	·51	·02	·50	·48	·48	·47	·49	·61	·41	·33	·39	·34	·24	·08
30		·02	·03	·10	·02	·04	·05	·03	·04	·06	·03	·04	·04	·02	·04	·04	·05	·04	·04	·06	·07	·27	·16	·25	·01	·01
31		·04	·03	·03	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	·01	..	..	..	..
*	5·80	5·45	4·24	3·92	5·25	4·28	4·80	4·16	4·65	4·43	4·46	4·51	4·29	4·19	4·44	4·40	4·16	4·31	4·36	4·25	4·52	5·50	5·29	5·76	5·97	6·10
†	26·60	24·81	22·86	21·43	25·12	21·25	21·01	23·31	25·12	24·00	23·18	24·15	23·10	23·75	22·83	23·03	22·84	22·69	25·21	22·81	23·14	23·39	22·08	21·57	22·28	20·22

MONTHLY GAUGE.

† The totals from January 1st.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	..	·02	·03	·02	·02	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01
6	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	·02	..	·01	..	..	·01	..	·01	·01	·01	..	..	..	·01	·01	..	..	·01	·01	·01	..	·02	·01
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	·01	..	·01	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	·05	·04	·07	·04	·07	..	·08	·03	·04	·04	·06	..	·07	·03	·04	·04	·03	·05	·05	·07	·06	·06	·08	·06	·08	·09
17	·68	·57	·43	·72	·58	·03	·88	..	·96	1·48	1·28	·98	1·30	1·10	1·61	·63	·64	·73	1·61	1·11	1·00	1·61	1·75	1·62	·55	·77
18	·04	·03	·07	·04	·05	..	·04	·81	·04	·10	·08	·18	·07	·10	·41	·33	·14	·28	·42	·35	·20	·14	·10	·05	·03	·05
19	·01	·03	·03	·03	·03	·01	·04	·16	·18	·04	·07	·05	·09	·14	·08	·03	·03	·05	·08	·03	·05	·03	·02	·03	·01	·03
20	..	..	..	·01	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	·03	·04	·03	·03	·02	·04	·02	·03	·04	·04	·05	·04	·01	·04	·05	·03	·04	·03	·04	·04	·03	·05	·03	·04	·06
22	·03	·01	·02	·02	·01	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	3·25	3·21	2·84	2·60	2·19	·89	1·67	·14	1·14	1·32	1·17	1·27	1·13	1·08	1·03	·43	1·01	1·01	1·19	1·12	1·27	1·38	1·62	1·42	1·55	1·68
24	..	·01	..	..	..	·73	..	1·29	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
25	·45	·47	·38	·44	·29	..	·40	..	·83	·87	·87	·82	·87	·70	·66	·88	·81	·89	·92	·78	·81	1·09	1·00	·90	·74	·60
26	·25	·44	·33	·22	·55	·57	·35	1·45	·03	·13	·15	·11	·17	·11	·27	·12	·26	·20	·08	·11	·19	·20	·18	·24	·33	·36
27	·15	·13	·11	·16	·09	..	·09	·09	·05	·04	·07	·08	·06	·05	·04	·13	·11	·09	·10	·13	·08	·09	·10	·08	·08	·10
28	·32	·39	·35	·29	·33	·08	·30	·09	·29	·34	·31	·38	·35	·33	·22	·24	·33	·32	·37	·19	·30	·45	·49	·40	·41	·34
29	·26	·20	·26	·40	·28	·23	·29	·67	·25	·19	·29	·21	·36	·40	·52	·18	·33	·37	·30	·22	·22	·25	·27	·21	·20	·20
30	·05	·04	·22	·16	·13	·08	·19	·08	·06	·07	·07	·03	·05	..	·01	·01	..	·01	·01	·02	·07	·06	·08	·06	·07	·06
31	..	..	..	..	·01	·03	..	·01	·01	..	·01	..	·02	..	..	·02	..	..	..	..	·01	..	..	..	..	·02
*	5·54	5·62	5·18	5·20	4·67	2·71	4·38	4·85	3·92	4·66	4·48	4·19	4·59	4·05	4·93	3·11	3·73	4·05	5·16	4·17	4·31	5·40	5·75	5·10	4·11	4·38
†	21·87	23·00	22·44	22·29	22·10	16·07	22·36	25·24	19·54	21·48	20·72	21·08	20·78	17·16	21·00	19·02	19·48	19·57	22·14	21·48	21·53	23·18	23·25	21·45	21·31	21·93

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..
5	..	..	·04	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	·02	·01	..	·01	..
13	..	..	..	..	..	..	..	..	..	..	..
14	..	..	·01	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..
16	·10	·08	·04	..	..	·08	·08	·07	·05	·06	..
17	·77	·68	·78	·57	·63	·46	·37	·39	·57	1·50	1·05
18	·05	·07	·03	..	·03	·05	·10	·11	·06	·14	·23
19	..	..	·03	·26	·14	·02	·01	..	·01	·01	..
20	..	..	..	..	..	..	..	..	..	..	..
21	·05	·03	·03	..	..	·01	·01	·01	·02	·02	..
22	..	..	·01	·01	..	..	..	..	..	..	..
23	1·70	1·73	3·94	4·03	4·41	2·68	3·15	2·48	1·55	1·53	1·09
24	..	·01	·01	·01	·03	..	..	..	..	..	·02
25	·49	·45	·47	·20	·10	1·56	·47	·39	·63	·92	1·01
26	·21	·29	·34	·26	·51	·27	·18	·29	·23	·26	·08
27	·08	·07	·11	·11	·09	·08	·08	·06	·07	·09	·05
28	·45	·40	·37	·38	·44	·49	·53	·49	·47	·45	·34
29	·28	·26	·15	·09	·14	·17	·26	·21	·15	·19	·26
30	·04	·03	·02	..	·02	·02	·01	·01	·01	·02	·02
31	..	..	..	..	..	..	..	..	..	..	..
*	4·22	4·10	6·38	5·92	6·54	5·89	5·27	4·52	3·82	5·20	4·15
†	20·65	20·18	22·77	19·51	20·62	20·72	20·84	19·09	16·95	22·09	17·62

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(July, 1903.)

The month can be divided—the first fifteen days being practically rainless, and the second sixteen days being extremely wet. For the first time since this organization was founded there have been falls of over four inches, *viz.* at Wilmington and Dartford. One of the most remarkable features of this and the previous months is the number of falls exceeding one inch. In this month alone in some places there are as many as three such falls. At Greenwich in fifteen hours, from 6 p.m. on the 23rd to 9 a.m. on the 24th, 2·98 in. fell; at Nutfield on the 19th just over an inch fell in an hour; at Benhilton on the 26th over half an inch fell between 9.35 a.m. and 9.50 a.m.; at Reigate Hill 1·10 in. fell in a thunderstorm on the 29th between 5 p.m. and 6 p.m.; and at Farningham Hill on the 23rd ·21 in. fell up to 6 p.m., 1·07 in. from 6 p.m. to 6.43 p.m., and 2·50 in. from 6.43 p.m. to 9 a.m. on the 24th. The observer at Abinger Hall says that there were several frosts. At Nutfield the observer says: "The longest streak of lightning I ever saw was in the S.W. on the 19th; it was of the slighter zigzag order, and came from the zenith to the horizon." At Sanderstead the observer says that there was dust in the gauge from the 23rd to the 28th. And at Redhill Mr. Tyndall mentions that a house was struck by lightning at 6 p.m. on the 29th. The month as a whole has been a healthy one. The mean temperature is about the average, and was at Clapham Park 63°·2, at Croydon (Duppas House) 62°·4, at Chipstead 62°·1, at Worcester Park 61°·4, at Wallington 61°·1, and at Warlingham 59°·8. Percolation was actively going on at the end of the month. There were recorded at Wallington 194·1 hours of sunlight, which is sixteen hours or three per cent. below the July average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·03	..	·02	·04	·03		·05	·03	·02	·04	·03	·02	·03	·04	·03	..	·04	·04			·05	·03		·05	·06	·08
2	·15	·19	·13	·17	·19		·19	·20	·12	·16	·19	·19	·20	·22	·25	·30	·25	·27			·24	·22		·27	·21	·24
3	..	..	..	..	..		..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
4	·02	..	·01	·03	..		..	..	..	·01	·01	·01	·01	..	..	..	·01	..			·02	..		..	..	..
5	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
6	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
7	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
8	..	..	..	..	..		..	..	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	..
9	·22	·23	·24	·25	·17		·22	·20	·15	·17	·22	·26	·30	·21	·32	·31	·17	·30			·26	·36		·26	·26	·10
10	·09	·19	·05	·18	·13		·16	·16	·14	·22	·14	·08	·10	·09	·07	·75	·03	·10			..	·04		·09	·16	1·08
11	1·22	1·25	1·17	1·18	1·00		·98	1·00	·97	·91	·95	·94	·93	1·10	·97	1·00	·93	·79			·82	·65		1·08	1·06	·01
12	..	..	..	..	..		..	..	..	..	..	..	..	..	..	·01	..	..			..	..		..	·01	..
13	·34	·43	·28	·21	·01		·08	·12	·09	·01	·09	·08	·08	·04	·02	·13	·02	..			..	·25		..	·02	·02
14	·36	·44	·45	·50	·51		·67	·67	·41	·68	·67	·59	·71	·65	·52	·58	·51	·67			·64	·66		·68	·64	·80
15	·02	..	·02	·04	·02		·03	·03	·01	·02	·02	·07	·02	·03	·02	·02	·04	..			·06	·09		·04	·02	·03
16	·50	·45	·38	·40	·36		·29	·30	·32	·44	·54	·35	·52	·50	·52	·55	·41	·35			·37	·33		·57	·36	·30
17	·13	·12	·10	·22	·16		·13	·14	·10	·21	·18	·15	·13	·12	·10	1·50	·25	·19			·23	·28		·10	·06	·05
18	·12	·32	·42	·82	·33		·21	·17	·11	·43	·67	·75	·67	·60	·73	·64	·98	1·08			·58	·75		·63	·32	·28
19	·09	..	..	·02	·05		·06	·05	·06	·03	·05	·04	·07	·01	..	·01	·02	·01			·11	·30		..	..	·01
20	·50	·51	·39	·33	·36		·32	·45	·38	·31	·45	·38	·41	·33	·44	·42	·45	·45			·47	·37		·45	·25	·20
21	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
23	·32	·32	·23	·28	·35		·15	·15	·19	·12	·20	·14	·16	·16	·14	·14	·11	·14			·09	·25		·30	·12	·11
24	1·37	1·70	1·98	1·60	·21		·35	·37	·33	·47	·37	·33	·47	·49	·36	·33	·23	·25			·42	·20		·18	·38	·37
25	·02	..	..	·02	·03		·03	·02	·06	·02	·02	·04	·03	·04	·03	·03	·09	·08			·07	·05		..	·02	·06
26	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
27	·04	·02	·03	·05	·03		·03	·03	·02	·03	·05	·03	·04	·03	·03	·04	·04	..			·04	·05		·06	·11	·04
28	·09	·07	·06	·07	·09		·09	·08	·06	·08	·09	·09	·08	·08	·08	·09	·13	·18			·14	·13		·08	·03	·10
29	..	..	..	·02	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
30	..	..	·01	·02	·01		·01	..	..	·03	·07	·05	·05	·04	·04	·05	..	·04			·05	·01		·07	·04	·04
31	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
*	5·63	6·24	5·97	6·45	4·04	3·43	4·05	4·17	3·56	4·39	5·01	4·59	5·01	4·78	4·67	6·90	4·71	4·94	4·23	3·36	4·66	5·02	4·51	4·91	4·13	3·92
†	29·11	30·06	30·04	32·16	25·71	26·15	25·55	26·40	22·90	26·38	29·32	27·96	27·96	29·39	28·93	30·91	28·23	27·68	27·82	22·23	29·55	27·72	27·83	30·75	27·95	26·64

MONTHLY GAUGE.

* The figures in this row give the totals for the month.

† The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		·07	·11	·09	·09	·10	·11	·10	·09	·09	·09	·08	·08		·09	·09	·08	·07	·09	·05	·08	·08	·08	·07	·08	·11
2		·11	·22	·22	·23	·31	·24	·23	·28	·25	·23	·28	·25		·22	·26	·23	·26	·29	·25	·30	·26	·19	·27	·25	·24
3		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	·01
4		·01	..	..	..	..	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	·01	·01	..	..	..	·01
5		·01	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
6		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
7		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
8		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
9		·21	·25	·20	·28	·18	·18	·20	·17	·18	·17	·16	·18		·18	·20	·19	·18	·25	·23	·21	·21	·25	·19	·14	·13
10		·16	·10	·16	·06	·09	·11	·10	·08	·17	·08	·09	·08		·19	·07	·10	·12	·12	·15	·09	·14	·13	·15	·28	·40
11		·95	·95	·80	1·20	1·03	·95	1·50	1·17	1·10	·94	1·05	1·08		1·06	1·09	1·36	1·14	1·14	·99	1·14	1·06	1·03	·87	·79	·83
12		..	..	..	..	..	..	·07	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
13		..	·18	..	·11	·04	..	..	·06	·03	..	·01	·04		..	·02	..	·04	..	·03	·03	·01	·01	..	..	·03
14		·59	·36	·46	·01	·40	·49	·54	·35	·38	·47	·51	·45		·39	·58	·71	·65	·59	·55	·53	·57	·40	·38	·47	·38
15		·02	·03	·02	·01	·03	·03	·05	·03	·03	·02	·02	·02		·03	·01	·02	·02	·04	·04	·05	·03	·03	·02	·09	·06
16		·41	·26	·28	·35	·22	·25	·25	·29	·29	·26	·34	·34		·22	·31	·32	·33	·53	·33	·37	·30	·29	·30	·29	·20
17		·17	·08	·06	·09	·09	·08	·07	·09	·09	·09	·08	·07		·09	·05	·07	·06	·05	·05	·04	·12	·05	·04	·06	·05
18		·64	·17	·16	·26	·32	·24	·25	·35	·29	·24	·34	·29		·23	·24	·23	·27	·29	·33	·27	·16	·26	·25	·28	·26
19		..	·05	·15	..	·02	·02	·05	·04	·02	·01	·01	·01		·01	..	·02	·01	·03	·01	·10	·11	·11	·06	·12	·12
20		·20	·20	·14	·28	·16	·17	·18	·16	·15	·14	·16	·16		·16	·16	·17	·16	·21	·22	·19	·17	·19	·19	·22	·12
21		·02	..	..	..	..	..	..	..	..	..	..	..		·01	·01	..	..	..	..	..	..	..	..	..	..
22		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
23		·20	·20	..	·21	·15	·14	·20	·11	·11	·10	·09	·10		·09	·10	·01	·11	·04	·10	·08	·10	·10	·09	·11	·04
24		1·87	1·95	2·06	1·07	1·21	1·40	1·65	·62	·66	·47	·55	·47		·46	·46	·54	·37	·35	·30	·30	·28	·19	·17	·19	·18
25		·02	·06	·04	·04	·03	·02	·05	·04	·05	05	·06	·06		·06	·06	·05	·05	·12	·07	·09	·08	·08	·04	·04	·05
26		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	·01	..	..	..
27		·05	·06	·06	·05	·04	·06	·10	·04	·04	·03	·04	·05		·04	·04	·04	·04	·04	·04	·02	·01	·03	·02	·03	·01
28		·04	·07	·05	·09	·09	·09	·12	·09	·09	·09	·09	·08		·11	·08	·10	·09	·10	·11	·09	·13	·10	·10	·10	·08
29		..	..	..	..	..	..	..	..	..	..	·01	..		..	..	..	..	..	..	..	..	..	..	..	..
30		·03	·05	·06	·05	·02	·05	·05	·03	·03	·02	·02	·02		·03	·03	·03	·03	·04	·05	·03	·04	·02	·01	·01	·01
31		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
*	5·90	5·78	5·35	5·01	4·48	4·53	4·63	5·76	4·09	3·99	3·50	3·99	3·83		3·67	3·86	4·27	4·01	4·32	3·90	4·02	3·87	3·56	3·22	3·55	3·32
†	32·50	30·59	28·21	26·44	29·60	25·78	25·64	29·07	29·21	27·99	26·68	28·14	26·93		26·50	26·89	27·11	26·70	29·53	26·71	27·16	27·26	25·64	24·79	25·83	23·54

MONTHLY GAUGE. RECORD CEASED.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·10	·15	·15	·10	·12	·01	·17	·01	·15	·08	·07	·02	·08	·08	·15	·11	·08	·09	·10	·04	·06	·07	·08	·08	·06	·08
2	·24	·28	·27	·20	·28	·07	·27	·09	·23	·22	·21	·29	·22	·21	·26	·22	·20	·23	·24	·25	·27	·29	·32	·23	·30	·31
3	..	..	..	..	..	·22	..	·23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..
4	..	..	..	·01	..	..	..	..	·01	..	·01	..	·01	..	..	..	..	..	·01	·01	·02	·02	·02	..	·01	·03
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	·14	·13	·14	·15	·19	·15	·20	..	·16	·16	·18	·18	·18	·22	·20	·19	·21	·21	·21	·16	·18	·17	·20	·20	·17	·18
10	·18	·16	·20	·17	·12	·23	·21	·28	·05	·15	·11	·12	·10	·04	·04	·02	·06	·05	·08	·11	·16	·27	·32	·21	·23	·22
11	1·12	1·27	1·25	1·06	1·24	·41	1·25	·24	·87	·82	·90	·80	·87	·69	·83	·69	·62	·69	·84	·58	·90	·89	·98	·75	·93	1·12
12	..	..	..	..	..	..	..	·80	..	..	..	·01	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
13	..	..	·05	..	·02	..	..	..	..	·02	·01	·03	·07	..	·11	·07	·09	·06	·10	·13	·05	..	·03	·22	·16	..
14	·50	·63	·58	·59	·60	·28	·19	·32	·10	·21	·31	·38	·25	·36	·26	·23	·21	·26	·21	·13	·35	·23	·22	·01	·16	·33
15	·02	·03	·03	..	·03	·04	·21	·14	·31	·01	·01	·03	·02	..	..	·01	·03	·01	..	·02	·03	·02	·01	..	·02	·02
16	·22	·22	·24	·26	·26	..	·24	..	·20	·23	·24	·28	·27	·22	·26	·26	·24	·23	·28	·30	·31	·27	·26	·25	·25	·25
17	·05	·04	·06	·05	·10	·10	·08	·19	·05	·04	·04	·05	·05	·04	·03	·06	·05	·03	·05	·05	..	·08	·07	·05	·04	·06
18	·21	·23	·20	·20	·13	·21	·18	·07	·19	·20	·23	·25	·24	·18	·27	·24	·07	·16	·23	·18	·22	·29	·28	·22	·27	·22
19	·03	·03	·06	·11	·06	·06	·12	·23	..	·01	·01	..	·01	·06	·02	..	·02	·02	·03	..	..	·02	·02	·02	·04	·04
20	·13	·12	·12	·12	·13	·04	·22	·01	·17	·17	·20	·23	·18	·16	·16	·18	·24	·21	·25	·20	·24	·20	·20	·16	·18	·18
21	..	..	..	..	..	..	..	·12	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	·07	·10	·09	·09	·08	..	·12	..	·27	·11	·13	·16	·12	·13	·15	·15	·16	·15	·21	·21	·16	·06	·13	·10	·11	·10
24	·15	·24	·23	·28	·29	·31	·47	1·24	1·30	1·20	1·38	1·52	1·42	1·46	1·55	1·28	·91	1·51	1·33	·87	1·60	1·56	1·39	1·32	1·06	·60
25	·05	·07	·09	·08	·08	·25	·07	·24	·04	·20	·03	·01	·03	·03	·02	·06	·04	·02	·02	..	·02	·04	·05	·01	·04	·08
26	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
27	·03	·03	·04	·03	·04	..	·02	..	·05	·05	·06	·07	·06	·04	·05	·06	·07	·05	·07	·07	·06	·06	·07	·07	·07	·07
28	·17	·16	·16	·12	·16	·03	·03	·06	·15	·11	·11	·14	·10	·09	·09	·06	·11	·11	·12	·14	·15	·14	·15	·10	·12	·14
29	..	..	..	..	..	·09	·18	·12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	·01	·02	·02	..	·02	·01	·02	·10	·01	·02	·02	..	·02	·02	·01	..	·01	·03	·04	·03	·03	·01	·01	·03
31	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	3·41	3·89	3·97	3·65	3·95	2·50	4·25	4·41	4·32	4·10	4·25	4·62	4·30	4·01	4·47	3·93	3·42	4·09	4·39	3·48	4·82	4·71	4·83	4·02	4·23	4·06
†	25·28	26·89	26·41	25·94	26·05	18·57	26·61	29·65	23·86	25·58	24·97	25·70	25·08	21·17	25·47	22·95	22·90	23·66	26·53	24·96	26·35	27·89	28·08	25·47	25·54	25·99

* The figures in this row give the totals for the month.

† The totals from January 1st.

Daily Rainfall. August, 1903.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sideup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·09	·08	·10	·07	..	·07	·07	·06	·05	·06	·08
2	·27	·29	·29	·26	..	·27	·27	·25	·26	·28	·23
3	..	..	..	..	..	..	..	..	..	·02	·02
4	·02	·02	..	..	..	..	·01	·02	·01	·02	..
5	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..
9	·20	·19	·20	·19	·10	·16	·21	·24	·20	·18	·16
10	·35	·39	·40	·54	·50	·49	·44	·51	·39	·38	·34
11	1·07	1·04	1·20	·98	1·03	1·20	1·15	1·00	1·13	1·02	·72
12	..	..	..	..	..	·01	..	..	..	..	..
13	..	·01	..	..	..	..	..	..	·01	..	·07
14	·33	·30	·38	·31	·29	·68	·32	·28	·20	·20	·15
15	·02	·02	..	·08	..	·02	..	..	..	..	·10
16	·25	·26	·24	·23	·24	·27	·29	·26	·23	·24	·32
17	·05	·05	·09	·05	·09	·08	·04	·04	·05	·06	·04
18	·28	·25	·35	·17	·15	·28	·18	·22	·21	·22	·15
19	·07	·04	..	·17	·30	·17	·42	·22	·02	·12	·02
20	·16	·15	·12	·08	·10	·15	·18	·16	·13	·18	·16
21	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	·06	·08	·08	·06	..	·07	·09	·04	·08	·06	·11
24	·48	·82	·23	·16	·31	·27	·91	·97	·93	1·27	1·26
25	·09	·07	·10	·03	·03	·18	·04	·04	·06	·06	·03
26	..	..	..	..	..	..	..	..	..	..	..
27	..	·06	·05	·02	·03	·05	·05	·04	·04	·07	·04
28	·18	·14	·13	·09	·10	·13	·14	·12	·11	·15	·12
29	..	..	..	..	..	..	..	..	..	..	..
30	·03	·03	·01	..	..	·03	·01	·01	·02	·03	·01
31	..	..	..	..	..	..	..	..	..	..	..
*	4·00	4·29	3·97	3·49	3·27	4·58	4·82	4·48	4·13	4·62	4·13
†	24·65	24·47	26·74	23·00	23·89	25·30	25·66	23·57	21·08	26·71	21·75

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(August, 1903.)

The month has again been wet; in fact, it is the wettest August since 1891. We have again the phenomenon of further falls of rain exceeding one inch; in many places there are as many as two such falls. With reference to the rate of fall: at Abinger Hall 1·62 in. of rain fell on the 24th between 9 a.m. and 5 p.m.; at Clapham Park, on the same day, ·81 in. fell between 3 and 5 p.m., and in the ten minutes between 8.25 and 8.35 p.m. ·57 in.; and at Clapham Park on the 10th ·25 in. fell in five minutes. There has been a good deal of scarlet fever about, but diphtheria does not seem to be so prevalent, except in a few places. The observer at Avondale Road, Croydon, remarks that "the unusual wet has produced a blight in vegetable marrows, tomatoes (out of doors), and potatoes, even on sloping ground on the chalk"; and the observer at Nutfield says that "wasps are very busy, but small in comparison, and that the birds have left, there being no hardy fruit to keep them." Solar halos were seen at Greenwich on eight days, and at Upper Gatton on four days. Thunder was heard and lightning seen at many places throughout the district. The rainfall is about double the August average. The mean temperature is about two degrees below the average, and was at Croydon (Duppas House) 60°·4, at Chipstead 59°·7, at Wallington and Worcester Park 59°·6, at Clapham Park 58°·8, and at Warlingham 57°·9. There were recorded at Wallington 201·8 hours of sunlight, which is 3·5 hours or one per cent. above the August average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
2	·04	·03	·02	·02	·05	·05	·06	·06	·05	·05	·06	·05	·06	·06	·04	·05	·08	·09			·12	·10		·08	·05	·03
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
4	1·46	1·32	1·76	1·50	·68	·65	·62	·60	·77	·72	·98	·51	·75	·94	·55	·52	·42	·32			·55	·74		·40	·55	·65
5	·02	·12	..	..	·04	·03	..	..	..	·06	·01	..	·01	..	..	..	·01	..			·03	·02		..	·01	..
6	·02	..	·02	·02	..	..	·01	·02	·01	·01	·01	·02	·02	·01	..	·02	..	·02			·04	·05		..	..	·01
7	..	..	..	..	·01	·02	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
8	·11	·13	·10	·16	·13	·12	·12	·11	·08	·10	·17	·11	·15	·15	·19	·13	·14	·17			·17	·14		·22	·12	·08
9	·01	·04	·03	..	·03	·03	·03	·03	·01	·05	·07	·07	·08	·07	·07	·06	·03	·06			·04	..		·04	·02	·05
10	·73	·60	·56	·65	·70	·75	·70	·73	·59	·65	·70	·67	·65	·65	·65	·75	·67	·71			·75	·66		·79	·53	·47
11	·21	..	·10	·04	·02	·03	·02	·02	..	·05	·01	·01	·02	·01	..	·02	..	..			..	..		·01	·02	..
12	·02	·10	·03	·02	·04	·10	·06	·04	·04	·03	·10	·10	·08	·01	·02	·01	..	..			..	..		·02	·03	..
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..			..	..		..	·01	..
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
18	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	·01	..			·01	..		..	·01	·01
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
21	·09	·13	·12	·20	·02	·03	·01	·01	·02	·03	·02	·03	·01	·01	..	·02	..	..			·02	·02		·02	·01	..
22	·06	·03	·04	·05	·05	·05	·05	·06	..	·05	·06	·05	·05	·05	·07	·04	·07	·09			·07	·10		·04	·04	·05
23	·01	..	..	..	·01	..	..	..	..	..	..	..	..	..	·02	..	..	..			..	..		..	·01	..
24	·03	..	·03	·15	·06	·05	·03	·03	·08	·05	·09	·02	·02	·04	..	·03	..	..			..	·05		·02	·01	·02
25	·09	·04	..	..	..	..	..	..	..	·01	..	·13	..	·02	..	·05	·01	..			..	..		·01	..	..
26	·30	·35	·31	·40	·03	·26	·07	·07	·19	·03	·14	·11	·23	·09	·09	·11	·02	·08			..	·09		·08	·14	·06
27	·07	·04	·11	·03	·30	·07	·18	·18	·08	·28	·20	·10	·07	·22	·12	·08	·09	·03			·11	·03		·07	·04	·10
28	·19	·26	·22	·18	·07	·08	·56	·56	·18	·11	·14	·06	·06	·13	·08	·08	·04	·03			·06	·10		·08	·06	·07
29	·51	·52	·52	·57	·64	·56	..	..	·64	·61	·67	·56	·58	·65	·55	·66	·63	·62			·76	·61		·62	·53	·51
30	·01	..	..	..	..	..	·01	·01	·01	..	..	..	..	..	..	..	..	..			..	..		..	..	·01
*	3·98	3·71	3·97	3·99	2·88	2·88	2·53	2·53	2·76	2·89	3·43	2·60	2·84	3·11	2·45	2·63	2·23	2·22	2·75	1·96	2·73	2·71	2·08	2·50	2·20	2·12
†	33·09	33·77	34·01	36·15	28·59	29·03	28·08	28·93	25·66	29·27	32·75	30·56	30·80	32·50	31·38	33·54	30·46	29·90	30·57	24·19	32·28	30·43	29·91	33·25	30·15	28·76

MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farning-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.		IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		..	..	..	..	..	·06	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
2		·03	·02	..	·07	·05	·01	·08	·06	·06	·05	·04	·05		·04	·03	·04	·04	·07	·07	·08	·13	·08	·08	·09	·05
3		..	..	..	..	..	·01	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
4		1·42	1·45	1·55	1·37	1·53	1·45	1·80	1·25	·96	·78	·78	·72		·80	·76	·77	·50	·34	·35	·42	·30	·27	·42	·78	·57
5		·01	·02	·06	..	..	·02	·06	..	..	..	..	..		..	..	·02	..	·06	..	..	..	·02	..	·02	·01
6		·02	..	·03	..	·02	·03	·07	·02	·02	..	..	·02		·02	·02	·02	·02	·02	..	..	·03	·02	·01	·03	·03
7		..	..	..	..	..	·09	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
8		·09	·08	..	·10	·07	·01	·10	·06	·07	·09	·08	·06		·10	·06	·08	·08	·09	·10	·12	·13	·10	·07	·08	·08
9		·04	·08	·15	·05	·06	·10	·08	·06	·05	·03	·04	·04		·03	·02	·02	·04	·03	·04	·02	..	·04	·04	·03	..
10		·49	·40	·38	·52	·34	·33	·35	·35	·36	·33	·40	·36		·35	·39	·43	·45	·59	·54	·60	·62	·61	·74	·68	·52
11		·03	·02	..	·02	·01	·02	·05	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	·03	..
12		·07	..	..	·04	..	·01	..	..	..	..	·01	..		·01	..	·01	..	..	..	..	..	·01	·01	·01	·01
13		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
14		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
15		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
17		..	..	..	..	..	..	..	..	..	..	..	..		..	..	·02	..	..	..	..	..	..	..	..	..
18		..	..	..	..	..	·02	·03	·02	·02	..	·02	·01		·02	·02	..	·02	·02	·01	..	·01	·01	..	·02	·06
19		..	..	..	..	·01	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
20		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	·01	..
21		·05	·03	·05	·01	·01	·01	..	·01	·01	..	·01	·01		..	·01	·01	·01	..	..	..	·08	·01	..	·01	..
22		·05	·08	·08	·03	·05	·05	·05	·07	·08	·08	·06	·06		·06	·06	·07	·07	·08	·06	·08	·15	·12	·10	·13	·11
23		..	..	..	·04	·01	..	..	·01	..	..	..	..		..	·01	·01	·01	..	..	..	..	·01	..	·01	..
24		·06	·13	·10	·05	·03	·03	..	·03	·02	·02	·01	·02		·01	·01	·01	·02	·02	·03	·01	..	..	..	·04	..
25		..	..	·05	..	·05	·02	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	·01	·12
26		·21	·23	·27	·20	·08	·24	·16	·11	·10	..	·10	·08		·09	·10	..	·06	·02	·06	·05	..	·02	..	·03	·01
27		·20	·27	·19	·10	·18	·07	·25	·14	·14	·20	·12	·13		·12	·05	·17	·10	·13	·07	·02	·12	·05	·07	·07	·06
28		·21	·16	·15	·19	·15	·10	·15	·09	·06	·03	·04	·04		·05	·05	·07	·07	·09	·08	·03	..	·02	·03	·10	·07
29		·54	·54	·53	·53	·40	·40	·65	·48	·40	·39	·44	·41		·41	·43	·46	·53	·48	·50	·51	·46	·57	·57	·62	·47
30		..	..	·01	..	·01	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	..	..	..	·01	..
*	3·20	3·52	3·51	3·60	3·32	3·06	3·08	3·88	2·76	2·35	2·00	2·15	2·01		2·11	2·02	2·21	2·03	2·04	1·91	1·94	2·03	1·96	2·14	2·81	2·17
†	35·70	34·11	31·72	30·04	32·92	28·84	28·72	32·95	31·97	30·34	28·68	30·29	28·94		28·61	28·91	29·32	28·73	31·57	28·62	29·10	29·29	27·60	26·93	28·64	25·71

MONTHLY GAUGE.

RECORD CEASED.

† The totals from January 1st

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	·08	·09	·10	·10	·05	·03	·02	..	·05	·03	·02	·02	·02	·01	·02	·01	..	·02	·02	·01	·02	·03	·04	·02	·05	·04
3	..	..	..	..	..	..	·01	·05	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4	·26	·34	·32	·32	·41	·06	·85	·70	1·51	1·26	1·20	1·15	1·28	1·30	1·26	1·58	1·93	1·48	1·55	1·48	1·20	1·19	1·24	·75	1·05	·80
5	..	..	..	..	..	..	..	·96	·05	..	..	·01	..	..	..	·02	..	..	·02	..	..	·02	·01	·01	·01	..
6	..	·02	·02	·03	·02	..	·02	·01	·02	·03	·02	·01	·02	..	·02	·01	·01	·01	..	·01	·02	·03	·03	·01	·02	·05
7	..	..	..	..	..	·09	·02	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..
8	·08	·12	·09	·09	·11	..	·04	..	·10	·09	·09	·13	·12	·10	·07	·06	·09	·06	·09	·06	·08	·12	·15	·10	·10	·09
9	·03	·03	·02	·03	·03	·04	·16	·08	·06	·04	·07	·04	·07	·05	·04	·03	·05	·04	·04	·02	·02	·02	·02	·01	·04	·04
10	·54	·53	·48	·53	·44	·22	·34	·16	·25	·30	·31	·35	·26	·18	·37	·29	·32	·30	·35	·32	·40	·33	·36	·20	·34	·36
11	..	..	..	..	..	·10	..	·20	·02	..	..	·01	·01	..	..	·02	..	..	..	..	..	..	..	·01	..	..
12	..	..	..	..	..	..	·02	..	..	..	·02	·04	·01	..	..	·01	..	..	..	·06	·07	·06	·03	..	·02	·03
13	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	·01	·02	·02	·02	·02	·01	·02	..	..	·01	·02	·01	..	..	·02	..	·01	..	·01	·02	..	·01	·02	·01	·01	..
19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	·01	·02	..	·01	·01	..	..	..	·01	·01	·02	·01	·02	·01	·02	·06	·09	..	·02	·02	·01	..	·01	·01	..	·03
22	·13	·12	·14	·09	·13	·06	·08	·10	·06	·04	·05	·05	·05	·05	·06	·06	·04	·07	·07	·05	·05	·09	·08	·07	·07	·10
23	·01	..	..	..	·02	·02	·01	..	·01	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	·01	·01	..	·02	..	·01	..	·05	·04	·07	·07	·06	·09	·14	·12	·14	·17	·07	·07	·05	·04	·03	..	·01	·03
25	·03	..	..	..	..	·01	·01	·09	·02	..	·02	..	·07	..	·06	..	..	..	..	..	..	..	·01	·03	·02	..
26	·08	·03	·05	..	·08	..	·01	..	·30	·11	·10	·34	·17	·36	·23	·25	·26	·05	·09	·36	·11	..	·12	·26	·10	·23
27	..	·09	·10	·11	·11	·22	·22	·28	·07	·16	·26	..	·19	·04	·18	·13	·13	·40	·40	..	·20	·30	·19	·02	·18	·07
28	·03	·03	·03	·04	·06	..	·04	..	·08	·05	·08	·10	·07	·09	·13	·12	·14	·13	·15	·14	·11	·07	·08	·07	·04	·08
29	·47	·52	·45	·44	·40	·32	·42	·36	·37	·34	·38	·38	·38	·40	·37	·48	·58	·48	·50	·44	·37	·33	·37	·37	·40	·40
30	..	..	..	..	..	..	..	·20	·01	..	..	·01	·01	..	..	..	..	..	..	..	..	..	·01	..	..	..
*	1·76	1·97	1·83	1·81	1·91	1·18	2·31	3·19	3·04	2·51	2·73	2·74	2·82	2·69	2·99	3·25	3·79	3·21	3·38	3·06	2·71	2·64	2·80	1·95	2·46	2·35
†	27·04	28·86	28·24	27·75	27·96	19·75	28·92	32·84	26·90	28·09	27·70	28·44	27·90	23·86	28·46	26·20	26·69	26·87	29·91	28·02	29·06	30·53	30·88	27·42	28·00	28·34

* The figures in this row give the totals for the month.

† The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..
2	·04	·03	·09	·05	·07	·06	·03	·03	·03	·02	·02
3	..	..	..	..	..	..	..	..	..	..	..
4	·75	·83	·25	·74	·43	·36	·81	·82	·80	1·19	1·05
5	·01	..	..	..	..	..	·01	..	..	·03	..
6	·01	·03	·03	·02	..	·03	·04	·02	·03	·03	·01
7	..	..	..	..	..	..	..	..	..	..	..
8	·13	·15	·13	·09	·15	·17	·13	·08	·07	·10	·05
9	·04	·02	·03	·01	..	·02	..	..	·03	..	..
10	·33	·30	·48	·45	·36	·38	·38	·33	·26	·39	·32
11	·02	·01	..	..	..	..	..	..	..	..	..
12	..	..	·01	..	..	..	·01	·01	..	..	·04
13	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..	..	..	..	..
18	·02	·02	·02	..	..	·01	·01	·01	·03	·01	..
19	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..
21	·01	·02	·02	..	..	..	·01	·01	·01	..	..
22	·14	·15	·15	·11	·11	·16	·16	·15	·14	·07	..
23	..	·01	·01	..	..	·01	·01	..	..	..	..
24	..	·02	·01	·02	·03	·02	·03	·09	·03	·03	·05
25	·03	·01	·08	·09	..	·02	..	..	..	..	..
26	·23	·17	·05	·04	..	·07	·16	·08	·07	..	·16
27	·03	·10	·11	·06	·15	·13	·07	·15	·18	·23	·05
28	·04	·04	·03	·09	·05	·04	·03	·02	·03	·08	·08
29	·36	·38	·61	·48	·45	·50	·35	·33	·33	·34	·30
30	..	·02	..	..	..	..	..	..	..	..	..
*	2·19	2·31	2·11	2·25	1·80	1·98	2·24	2·13	2·04	2·52	2·13
†	26·84	26·78	28·85	25·25	25·69	27·28	27·90	25·70	23·12	29·23	23·88

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(September, 1903.)

The month has been somewhat cool, with about an average temperature; whilst the rainfall is somewhat variable, being slightly below the average at Greenwich, but three-quarters of an inch above the twenty years' average at Wallington, and about the average at Croydon. The month has been rather unhealthy, for scarlet fever has been somewhat prevalent, and also influenza. The wet weather seems to be becoming detrimental to garden crops, and the celery grub has done great damage. The gale on the 10th was general throughout the district, and caused great destruction amongst the trees. The thunderstorm on the 4th was experienced throughout the district. The observer at Abinger Hall mentioned that there was a severe frost on the 10th, which destroyed the vegetable marrows; and the observers at Redhill and Sevenoaks mention that primroses, violet, and laburnum were in flower for the second time at the end of the month; and Mr. J. E. Clark mentions that on the 15th there were acres of hay (twenty to thirty at least) in all stages above Marden Park station, and that the air was scented as in June. Solar halos were seen at Greenwich on the 1st, 2nd, 4th, 10th, 20th, and 23rd, and at Upper Gatton on the 10th and 23rd; whilst a lunar one was visible at Greenwich and Upper Gatton on the 3rd. The mean temperature of the month was at Croydon (Duppas House) 58°·6, at Worcester Park 57°·9, at Wallington 57°·6, at Chipstead 57°·0, at Warlingham 56°·5, and at Clapham Park 56°·1. There were recorded at Wallington 183·3 hours of sunlight, which is 23·1 hours or five per cent. above the September average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower gp.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	·03	·05	·06	·06	·03	·03	·02	·04	·03	·02	·03	·03	·01	..	MONTHLY GAUGE.	MONTHLY GAUGE.	·25	·59	MONTHLY GAUGE.	·03	·01	..
2	·05	..	·02	·03	·01	..	·01	..	·01	..	·03	·02	·04	·01	·02	·01	·02	..			·02	·01		..	·01	..
3	·29	·30	·22	·19	·20	·34	·25	·24	·30	·19	·20	·22	·16	·11	·18	·20	·24	·35			·21	·29		·20	·12	·09
4	·54	·62	·48	·48	·49	·47	·43	·47	·42	·49	·55	·45	·55	·60	·58	·59	·51	·51			·57	·41		·58	·53	·34
5	·07	·02	·04	·10	·06	·47	·04	·04	·04	..	·09	·06	·15	·19	·09	·08	·06	·04			·23	·05		·08	·13	·21
6	·36	·31	·28	·27	·37	·37	·35	·36	·30	·37	·36	·41	·30	·34	·40	·44	·45	·50			·36	·43		·44	·25	·19
7	·01	..	..	·03	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	·01
8	·20	·19	·11	·16	·21	·22	·19	·19	·18	·18	·19	·18	·19	·18	·20	·19	·17	·25			·34	·09		·18	·15	·12
9	·09	·07	·18	·02	·09	·09	·09	·09	·01	·08	·07	·03	·02	..	..	·03	·02	·01			·03	·02		·02	·02	·02
10	·09	·10	·10	·16	·06	·07	·08	·11	·07	·05	·09	·07	·08	·09	·08	·08	·09	·10			·07	·10		·09	·08	·07
11	1·60	1·32	1·62	1·35	1·05	·63	·96	·96	1·06	1·01	1·21	1·02	1·12	1·28	1·11	1·13	1·00	·98			1·00	·93		1·16	·95	·90
12	·36	·91	·56	·65	·87	1·27	1·02	1·02	·90	·92	·70	·96	·81	·67	·93	1·07	·79	1·02			1·14	·43		·82	·91	·89
13	..	..	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	..			..	..		..	·01	·01
14	·27	·25	·23	·25	·33	·31	·41	·39	·47	·25	·27	·39	·26	·24	·33	·37	·37	·47			·46	·25		·37	·20	·21
15	·03	·03	·01	..	..	..	·03	·04	·01	..	·01	..	..	..	..	..	..	..			..	..		·01	·01	..
16	·04	·04	·07	·08	·04	·06	·05	·04	·03	·05	·05	·03	·05	·05	·04	·04	·02	·02			·01	·01		·04	·05	·06
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			·01	..		..	..	..
18	·14	·11	·15	·11	·11	·12	·10	·10	·05	·10	·09	·05	·07	·01	·06	·04	·05	·05			·05	·05		·07	·06	·05
19	·04	·04	·03	·02	..	·02	·02	·02	·02	·02	·03	·02	·02	·02	·03	·03	·03	·03			·02	·04		·04	·02	·02
20	·03	·02	·02	·02	·02	·01	·02	·02	·03	·02	·03	·02	·03	·04	..	..	·01	·03			·05	·04		·03	·06	·03
21	·82	·64	·65	·65	·45	·62	·63	·60	·71	·41	·57	·56	·52	·50	·50	·59	·96	·82			·76	·82		·63	·61	·61
22	·34	·39	·20	·23	·42	·28	·32	·31	·29	·35	·25	·37	·26	·34	·29	·29	·40	·35			·50	·24		·34	·25	·19
23	..	..	..	..	..	..	..	..	·01	..	..	·01	..	..	·02	·03	..	..			..	·02		·01	..	·01
24	·33	·48	·41	·40	·25	·24	·30	·31	·22	·19	·18	·27	·19	·17	·26	·27	·15	·10			·12	·10		·33	·17	·19
25	·84	·81	·84	·70	·08	·08	·08	·08	·08	·07	·09	·06	·07	·06	·05	·07	..	·07			·06	·09		·07	·05	·06
26	·97	1·05	1·08	1·08	1·23	1·21	1·03	·98	1·36	1·03	1·11	1·24	1·25	1·06	1·20	1·38	·78	·66			·59	·61		1·36	1·15	1·05
27	·96	1·00	1·02	·80	·48	·57	·50	·59	·56	·54	·54	·50	·62	·62	·53	·64	·66	·88			·94	·56		·64	·59	·64
28	·03	·04	·05	·02	..	..	..	..	..	..	..	..	..	..	..	..	·02	·02			·13	·01		·01	·01	·01
29	·04	·05	·04	·05	·07	·07	·04	·05	·01	·05	·04	·03	·05	·04	·04	·03	·03	·02			·04	·04		·04	·03	·03
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
31	·46	·52	·52	·50	·31	·32	·25	·31	·32	·34	·46	·34	·43	·48	·42	·45	·41	·34			·33	·25		·40	·36	·39
*	9·00	9·31	8·93	8·35	7·33	7·89	7·26	7·38	7·50	6·75	7·23	7·35	7·27	7·12	7·39	8·08	7·25	7·62	8·03	6·12	8·29	6·48	7·72	7·99	6·80	6·40
†	42·09	43·08	42·94	44·50	35·92	36·92	35·34	36·31	33·16	36·02	39·98	37·91	38·07	39·62	38·77	41·62	37·71	37·52	38·60	30·31	40·57	36·91	37·63	41·24	36·95	35·16

* The figures in this row give the totals for the month.

† The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump.St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		..	..	..	..	..	..	..	..	..	..	·01	·01		..	·01	·01	·01	·01	·01	..	·02	·03	·10	·34	·35
2		·01	..	..	..	..	..	..	..	..	..	..	..		..	..	·01	·01	..	..	..	·01	..	..	..	·01
3		·09	·10	·10	·10	·08	·10	·10	·09	·09	·06	·07	·08		·08	·07	·07	·09	·09	·11	·08	·04	·08	·08	·09	·11
4		·33	·34	·32	·35	·30	·26	·25	·28	·29	·28	·28	·28		·26	·30	·28	·30	·30	·41	·42	·35	·40	·17	·42	·26
5		·19	·11	·12	..	·18	·09	·18	·23	·20	·19	·17	·16		·16	·15	·19	·23	·31	·21	·28	·21	·14	·31	·17	·10
6		·16	·12	·10	·34	·10	·07	·12	·10	·11	·09	·09	·10		·10	·10	·13	·14	·20	·20	·20	·18	·20	·17	·18	·13
7		·05	·06	·06	·03	·08	·04	·05	·05	·03	·04	·02	·02		·04	·01	·01	·01	..	..	..	..	..	..	..	..
8		·15	·15	·16	·16	·12	·13	·16	·12	·11	·10	·11	·11		·11	·11	·12	·12	·15	·17	·13	·14	·12	·13	·23	·08
9		·08	..	..	..	·03	·03	·05	·04	·03	·04	·03	·03		·04	·04	·04	·06	·09	·03	·07	·06	·07	·06	·07	·08
10		·08	·13	·07	·13	·09	·10	·10	·09	·08	·09	·10	·08		·08	·08	·06	·07	·08	·08	·05	·08	·07	·07	·06	·08
11		1·12	·92	·83	1·26	·85	·85	·98	·90	·86	·85	·93	1·00		·72	·66	·72	·80	·81	·94	·74	·79	·95	·82	·85	·47
12		·60	·53	·43	·66	·55	·41	·60	·65	·60	·59	·70	·54		·58	·68	·81	·82	1·04	·96	·80	·73	·50	·46	·79	·60
13		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
14		·18	·16	·15	·20	·12	·11	·13	·18	·20	·18	·17	·20		·17	·20	·21	·21	·21	·24	·20	·20	·30	·23	·24	·17
15		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	·01	..	..	..
16		·05	·05	·04	·06	·04	·03	·05	·05	·03	·02	·02	·03		·02	·02	·03	·04	·05	·06	·03	·03	·02	·01	·02	·04
17		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	·01	..	..	..	..	..	..	..
18		·11	·19	·08	·05	·06	·07	·05	·06	·07	·05	05	·06		·06	·05	·05	·05	·06	·05	·04	·09	·09	·10	·18	·06
19		·02	·02	·02	·02	·02	·01	·08	·02	·02	·02	·02	·02		·02	·02	·02	·03	·02	·05	·01	·03	·03	·01	·04	·05
20		·01	·06	·06	·03	·03	·03	·04	·03	·03	·02	·02	·02		·02	·02	·03	·02	·02	·03	·02	·02	·26	·02	·02	·04
21		·60	·50	·52	·59	·53	·54	·08	·45	·43	·41	·45	·43		·41	·44	·34	·60	·49	·66	·66	·61	·37	·63	·66	·58
22		·18	·15	·17	·14	·15	·12	·72	·16	·14	·12	·13	·13		·10	·14	·29	·18	·37	·25	·22	·20	·27	·30	·68	·72
23		..	..	..	..	·02	·01	..	·01	·01	..	·01	..		..	..	..	..	..	..	..	..	..	..	·02	·01
24		·40	·25	·20	·28	·27	·17	·25	·19	·18	·25	·16	·14		·14	·10	·12	·19	·28	·25	·24	·24	·27	·26	·12	·05
25		·85	·82	·63	1·08	·85	·62	1·07	·74	·54	·25	·21	·20		·29	·07	·05	·06	·06	·07	·05	·04	·06	·06	·04	·06
26		·70	·72	·70	·84	·60	·45	·60	·72	·75	·78	·88	·84		·72	·74	·86	·93	1·14	1·20	1·15	1·06	1·22	·95	·59	·42
27		·81	·81	·74	·67	·54	·49	·59	·55	·45	·42	·51	·48		·43	·49	·46	·55	·62	·71	·63	·46	·90	·78	·58	·43
28		·02	·03	·02	·04	·02	·01	..	·01	..	..	..	..		..	·01	·07	·03	·07	·02	·04	·17	·03	·02	·02	..
29		·03	·04	·04	·05	·03	·02	·05	·03	·03	·02	·02	·02		·02	·02	·02	·04	·04	·03	·02	·03	·02	·02	·02	·01
30		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
31		·38	·35	·28	·50	·31	·25	·30	·31	·30	·26	·31	·29		·26	·26	·29	·30	·30	·35	·32	·29	·28	·24	·21	·21
*	7·11	7·20	6·52	5·84	7·58	5·97	5·01	6·60	6·06	5·58	5·13	5·47	5·27		4·83	4·79	5·29	5·89	6·82	7·09	6·40	6·08	6·69	6·00	6·64	5·12
†	42·81	41·31	38·24	35·88	40·50	34·81	33·73	39·55	38·03	35·92	33·81	35·76	34·21		33·44	33·70	34·61	34·62	38·39	35·71	35·50	35·37	34·29	32·93	35·28	30·83

MONTHLY GAUGE. RECORD CEASED.

* The figures in this row give the totals for [illegible]

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (TheDowns)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandswth. Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	·01	..	·02	·01	..	..	..	·01	..	..	·01	·02	..	..	·02	·05	..	·02	·03	..	..	·01	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	·01	·01	·03	·01	·01	..	..
3	·07	·07	·08	·07	·09	..	·11	..	·09	·13	·11	·14	·10	·07	·08	·09	·11	·10	·11	·16	·17	·15	·16	·11	·11	·12
4	·27	·29	·28	·33	·25	·06	·29	·10	·30	·30	·31	·33	·32	·29	·32	·37	·30	·32	·35	·34	·33	·30	·35	·26	·29	·30
5	·24	·13	·15	·22	·17	·16	·12	·41	·13	·10	·09	·04	·10	·10	·08	·04	·05	·07	·06	·11	·06	·10	·10	·09	·12	·20
6	·14	·14	·13	·10	·13	·08	·14	·10	·13	·13	·14	·15	·14	·07	·11	·14	·12	·13	·12	·11	·13	·17	·17	·15	·15	17
7	..	..	·01	..	·02	·07	·08	..	·07	·04	·04	·04	·05	·04	·05	·04	·05	·03	·03	·05	·04	·05	·06	..	·03	·07
8	·14	·12	·12	·12	·12	·11	·13	·12	·13	·13	·13	·17	·13	·11	·12	·23	·20	·16	·20	·18	·14	·20	·17	·14	·13	·14
9	·07	·07	·07	·06	·05	·03	·06	·08	·07	·04	·05	·06	·06	·02	·02	·02	·02	..	·03	·05	·07	·06	·07	·05	·05	·07
10	·05	·07	·07	·07	·08	..	·09	..	·10	·11	·09	·13	·11	·10	·10	·14	·14	·14	·32	·18	·13	·17	·14	·11	·10	·13
11	·59	·59	·58	·72	·61	..	·60	·64	·60	·64	·78	·75	·71	·72	·67	·96	·95	·82	·79	·94	·84	·69	·73	·62	·65	·69
12	·71	·81	·87	·74	·67	·44	·56	·60	·03	·33	·37	·47	·38	·46	·55	·34	·37	·40	·35	·35	·42	·41	·37	·35	·45	·56
13	..	..	..	..	..	·03	..	·11	·51	..	·01	·06	..	..	..	·01	..	..	·02	..	..	·07	·01	..	..	..
14	·15	·15	·14	·19	·15	·27	·15	·01	·13	·12	·11	·13	·10	·13	·10	·23	·24	·19	·23	·20	·17	·13	·12	·11	·08	·09
15	..	..	..	·01	..	·10	..	·09	·01	·01	·01	·02	..	..	..	..	..	..	..	·02	·04	·01	·01	·01	·01	·01
16	·11	·01	·02	·02	·02	..	·02	·01	·05	·02	·04	·03	·04	·02	·03	·02	..	·04	·03	·03	·03	·01	·03	·01	·02	·03
17	..	..	..	..	..	·09	·03	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	·13	·11	·10	·09	·08	·15	·09	..	·07	·09	·10	·11	·09	·07	·08	·08	·11	·08	·10	·12	·09	·12	·11	·08	·07	·09
19	·03	·03	·05	·08	·02	·23	·01	·08	·01	..	·02	·04	·01	·01	·01	·03	·02	..	·02	·04	·02	·01	·02	·01	·01	·02
20	·03	·03	·04	·02	·03	..	·04	·03	·04	·06	·08	·08	·08	·05	·07	·04	·02	·07	·06	·05	·06	·08	·07	·08	·05	·05
21	·55	·56	·53	·55	·45	·02	·41	·32	·27	·30	·39	·35	·41	·39	·47	·32	·28	·33	·35	·25	·32	·35	·41	·46	·39	·36
22	·15	·14	·12	·20	·13	·05	·10	·33	·25	·16	·12	·20	·12	·12	·12	·13	·40	·14	·28	·30	·21	·19	·11	·04	·07	·09
23	..	..	·01	..	..	..	·02	·01	..	..	·02	·01	·01	..	·01	..	..	..	·01	·01	..	..	..	..	..	..
24	·18	·20	·16	·21	·13	·01	·14	·01	·03	·20	·22	·13	·22	·10	·20	·15	·18	·12	·18	·12	·12	·22	·22	·23	·22	·18
25	·05	·05	·05	·07	·04	·02	·25	·31	·17	·69	·90	·63	·78	·57	·97	·23	·11	·46	·33	·18	·68	·66	·54	·40	·68	·58
26	1·00	1·05	·89	1·12	·73	·76	·67	1·21	·65	·51	·54	·65	·54	·44	·54	·57	·57	·62	·66	·58	·62	·47	·47	·50	·47	·47
27	·78	·73	·43	·63	·45	·17	·43	·16	·45	·32	·36	·31	·37	·41	·51	·65	·65	·58	·57	·47	·31	·37	·36	·30	·34	·41
28	·04	·12	·13	·12	·02	·25	..	·51	·43	·01	·03	·05	·02	·01	·05	·07	·04	·03	·02	·02	·04	·02	·01	·02	·01	·02
29	·01	·01	·02	·03	·02	..	·01	·01	·02	·01	·02	·02	·02	..	·03	·03	·01	·02	·01	·02	·02	·03	·02	..	·01	·02
30	..	..	..	..	..	..	..	·01	·03	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..	·30	·26	·24	·27	·25	·29	·07	·29	·21	·24	·27	·25	·22	·27	·31	·27	·28	·28	·27	·27	·27	·30	..	·29	·34
*	5·49	5·79	5·31	6·03	4·74	3·35	4·84	5·35	5·07	4·66	5·32	5·41	5·18	4·52	5·56	5·26	5·26	5·13	5·53	5·19	5·34	5·34	5·15	4·14	4·80	5·21
†	32·53	34·65	33·55	33·78	32·70	23·10	33·76	38·19	31·97	32·75	33·02	33·85	33·08	28·38	34·02	31·46	31·95	32·00	35·44	33·21	34·40	35·87	36·03	31·56	32·80	33·55

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sideup	Wilming-ton	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	·01	..	·02	·24	·39	·01	..	..	..	..	..
2	..	·01	..	·02	..	·01	·01	..	..	·02	..
3	·14	·15	·13	·09	·11	·17	·20	·18	·15	·19	..
4	·29	·30	·25	·23	·20	·27	·31	·29	·26	·31	·15
5	·19	·13	·20	·22	·13	·12	·13	·11	·06	·08	·03
6	·15	·16	·14	·13	·10	·19	·17	·14	·10	·16	·03
7	·05	·05	..	..	..	·04	·04	·03	·04	·04	·03
8	·15	·14	·15	·21	·19	·11	·12	·12	·11	·18	·13
9	·06	·08	·08	·09	·11	·10	·08	·09	·08	·09	·06
10	·08	·11	·10	·07	·10	·11	·12	·10	·10	·10	·15
11	·70	·65	·61	·58	·55	·56	·66	·59	·63	·78	·80
12	·42	·49	·60	·37	·55	·64	·47	·42	·41	·41	·37
13	..	..	..	..	..	..	·01	·01	..	·04	..
14	·08	·09	·16	·12	·15	·15	·10	·08	·06	·12	·16
15	·03	·02	..	..	..	·05	·01	·02	·01	·03	..
16	·03	·02	·02	·01	·02	·03	·02	·01	..	·01	..
17	..	..	..	..	..	..	..	..	..	..	..
18	·11	·12	·18	·06	·06	·17	·14	·13	·10	·11	·13
19	·02	·01	·05	·03	·04	·02	·01	·01	·02	·02	·01
20	·05	·05	·05	·03	·05	·05	·04	·03	·03	·07	·06
21	·36	·35	·51	·55	·53	·42	·34	·31	·33	·23	·32
22	·07	·08	·20	·24	·17	·12	·08	·08	·05	·34	·22
23	..	..	..	..	·03	..	..	..	..	..	..
24	·15	·18	·18	·15	·13	·16	·14	·16	·11	·17	·17
25	·47	·54	·08	·04	·03	·04	·25	·46	·48	·72	·52
26	·48	·45	·98	·77	·75	·64	·41	·40	·37	·46	·45
27	·43	·44	·81	·45	·42	·66	·35	·35	·41	·31	·33
28	·01	·01	·08	·02	·05	·08	·01	·04	·01	·01	·01
29	·01	·02	·02	..	·01	·03	·02	·02	·02	·03	·02
30	..	..	..	..	..	..	..	..	..	..	..
31	·29	·36	·30	·25	·25	·33	·28	·25	·22	·29	·20
*	4·83	5·01	5·90	4·97	5·12	5·28	4·52	4·43	4·16	5·32	4·35
†	31·67	31·79	34·75	30·22	30·81	32·56	32·42	30·13	27·28	34·55	28·23

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(October, 1903.)

The month has been extremely warm, but the most remarkable feature is the amount of rain, the large number of rainy days, and the number of days having a fall of one inch and above. With reference to the total fall of rain, if we take the long record of Greenwich as fairly representing the district, the present October fall has only been exceeded seven times in the same month, *viz.* in the years 1835, 1841, 1846, 1855, 1865, 1880, and 1882. The number of rainy days is also exceedingly large, for at Wimbledon, Windmill, we have thirty days, and at Kenley and Morden twenty-eight, and the smallest number is twenty-one at the lofty station of Anerley. With reference to the falls of one inch and above we have the two Abinger stations and Caterham with no less than three such falls. There have been a considerable number of scarlet fever cases throughout the district, but diphtheria and enteric cases have been comparatively few. The month will also be renowned for the great magnetic disturbance on the 31st. Mr. N. F. Robarts, of South Norwood, reports that he saw a distinct aurora at 8.30 p.m. on the 29th. As an instance of the warmth of the month, the observer at Kenley reports that three queen wasps were killed in the house on the 28th, and one flew into the house at Wallington on the 31st. The rainfall is about two inches above the average. The mean temperature of the month is about three degrees above the average, and was at Croydon (Duppas House), Wallington, and Worcester Park 52°·8, at Chipstead 51°·5, at Warlingham 51°·2, and at Clapham Park 50°·3. There were recorded at Wallington 97·5 hours of sunlight, which is 2·9 hours or one per cent. below the October average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury. St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	..
2	·33	·29	·29	·27	·28	·30	·25	·25	·16	·28	·29	·27	·27	·24	·26	·24	·18	·16			·13	·12		·21	·21	·22
3	..	..	..	..	·01	..	·01	·01	..	..	·01	..	..	·02	..	..	..	..			..	..		..	·01	·01
4	..	..	·01	..	..	..	·01	·01	..	..	..	..	..	·01	..	·01	..	..			..	..		·01	..	·01
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
6	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	..	..	..			..	·02		..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
8	·04	·03	·02	·04	·03	·03	·04	·03	·02	·02	·02	·03	·02	·03	·03	·03	·03	..			·11	·04		·04	·05	·05
9	·03	..	..	·03	·04	..	·02	·02	·03	..	·04	·02	·03	·05	·04	·04	·04	·10			..	..		·06	·04	·05
10	..	..	..	..	..	..	..	..	·02	·03	..	..	..	..	..	..	..	..			..	..		..	..	·01
11	..	..	..	..	·01	..	·02	..	·01	·01	·01	·01	·01	·02	..	·01	..	·01			..	·01		·02	·01	·02
12	·02	..	..	..	..	·05	·01	·01	·01	..	·01	·01	..	·02	..	·02	·03	..			·04	·02		·03	·03	·04
13	·06	·07	·05	·05	..	..	..	·01	·01	..	·02	..	·01	..	·02	·01	..	..			..	·02		..	·05	·01
14	·04	·02	·07	·10	·07	·07	·06	·07	·06	·06	·08	·07	·08	·10	·08	·08	·06	·07			·07	·07		·09	·01	·06
15	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·02	..
16	..	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	·01	..	..			..	..		..	·02	..
17	·10	·10	·10	·08	·10	·10	·09	·08	·07	·09	·10	·06	·08	·09	·06	·06	..	·08			·08	·06		·07	·05	·07
18	..	..	..	..	·01	..	·01	·01	..	·01	·01	..	·01	..	..	·01	..	..			..	..		..	..	·01
19	..	..	..	..	..	..	..	..	·01	..	·01	..	..	..	..	·01	..	..			..	..		..	..	·01
20	·02	·02	·01	..	·01	·03	·02	·01	·01	·01	·01	·02	·02	·02	..	·01	..	..			..	·01		..	..	·01
21	·01	..	..	..	..	..	..	..	..	..	..	·01	..	..	·01	..	..	..			..	..		..	·01	·01
22	..	..	..	..	..	·01	..	..	·01	..	..	·04	·01	·02	..	..	..	..			..	..		·02	·10	..
23	·02	·12	·03	·12	·03	·03	·03	·03	·05	·02	·05	..	·03	·08	·06	·03	·07	..			·05	·07		·07	..	·05
24	·10	·02	·09	·04	·05	·05	·04	·06	·03	·05	·05	·05	·07	·02	·04	·07	..	·09			·06	..		·04	..	·05
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
26	·04	·09	·10	·03	·04	·05	·04	·03	·02	·02	·03	·02	·03	·03	·04	·04	·10	·06			·07	·07		·03	·03	·03
27	1·61	1·61	1·43	1·57	1·62	1·20	1·58	1·64	1·43	1·64	1·76	1·59	1·81	1·69	1·76	1·75	1·59	1·80			1·81	1·64		1·57	1·48	1·42
28	·36	·26	·26	·25	·27	·98	·31	·31	·32	·28	·26	·30	·25	·27	·31	·32	·44	·44			·42	·45		·34	·35	·36
29	·19	·12	·07	·07	·18	·05	·20	·19	·10	·15	·13	·20	·14	·11	·17	·17	·36	·25			·39	·30		·20	·15	·12
30	..	..	..	..	·05	..	·03	·05	·02	·04	·05	·06	·04	·04	·05	..	·03	·04			·07	..		·02	·04	·04
*	2·97	2·75	2·53	2·65	2·81	2·95	2·79	2·84	2·39	2·71	2·94	2·76	2·91	2·86	2·93	2·92	2·93	3·10	3·02	2·36	3·30	2·90	2·98	2·82	2·67	2·66
†	45·06	45·83	45·47	47·15	38·73	39·87	38·13	39·15	35·55	38·73	42·92	40·67	40·98	42·48	41·70	44·54	40·64	40·62	41·62	32·67	43·87	39·81	40·61	44·06	39·62	37·82

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn.rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump.St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		..	..	..	..	..	..	..	·01	..	..	..	..		..	..	..	..	..	..	..	·02		..	..	·01
2		·24	·30	·28	·30	·23	·19	·20	·23	·22	·18	·24	·24		·19	·22	·21	·19	·19	·20	·15	·18		·15	·18	·17
3		..	..	..	..	..	..	..	·01	..	..	..	..		..	..	·01	·01	..	·01	..	..		..	..	·01
4		·01	..	..	..	..	..	..	·01	..	..	·02	·01		..	..	..	·02	..	..	..	..		..	..	..
5		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
6		..	..	..	..	·01	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	..		..	..	..
7		..	..	..	..	..	..	..	..	..	..	·01	..		..	..	..	..	..	..	..	..		..	..	..
8		..	·07	·07	·08	·06	·05	·07	·08	·08	·06	·09	·08		·06	·05	·01	·05	·01	·05	·06	..		·02	·01	·02
9		·13	·03	·01	·06	·02	·02	·05	·03	·03	·04	·02	·03		·02	·04	·10	·06	·08	·05	·04	·14		·02	·05	·03
10		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
11		·01	·02	..	·02	·02	·01	·02	·01	·01	..	·01	·01		·01	·02	·02	·02	·02	·01	..	..		..	..	..
12		·01	·03	·04	·04	·04	·04	·05	·05	·05	·04	·04	·04		·04	·04	·06	·06	·06	·05	·07	·07		·05	·05	·08
13		·03	·02	·01	·03	..	..	·02	·01	..	..	..	..		..	..	..	..	..	·05	..	..		·03	..	..
14		·06	·04	·05	..	·05	·02	·03	·05	·04	·03	·04	·04		·03	·03	·03	·06	·07	·06	·04	·06		·02	·07	·03
15		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
17		·08	·10	·08	·08	·08	·07	·03	·07	·07	·05	·08	·06		·06	·06	·06	·06	·08	·07	·07	·07		·05	·09	·06
18		..	..	·01	..	..	..	·02	..	..	..	..	·02		..	·01	..	·02	..	..	..	..		..	..	..
19		..	..	..	..	..	..	..	·02	..	..	..	·01		..	·01	·01	·01	..	·01	..	..		..	..	..
20		·01	..	..	·03	·01	·01	·03	..	·01	..	·03	..		·01	..	·01	..	·02	·01	..	·03		..	·02	·01
21		..	..	..	..	..	..	..	·01	·01	..	..	·01		..	·01	..	..	..	·01	..	..		..	·01	..
22		..	..	·02	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
23		·08	·11	·04	·07	·01	·04	..	·06	·06	..	·05	·05		·05	·04	·01	·04	·03	·06	·08	..		..	..	·04
24		·03	·03	·07	·04	·08	·02	·03	·04	·03	·07	·03	·03		·02	·02	·05	·03	·06	·04	·01	·14		·04	·05	..
25		..	..	..	..	..	..	..	..	..	..	..	·01		..	..	..	..	..	..	..	..		..	..	..
26		·02	·04	·03	·03	·03	·03	·04	·02	·03	·03	·03	·03		·04	·04	·05	·04	·06	·04	·05	..		·05	·11	·04
27		1·16	1·15	1·01	1·49	1·30	1·17	1·20	1·36	1·32	1·60	1·38	1·30		1·23	1·25	1·31	1·40	1·47	1·63	1·56	1·20		1·42	1·34	1·01
28		·26	·22	·20	·25	·29	·28	·32	·34	·34	·33	·24	·33		·33	·24	·39	·34	·41	·37	·42	·40		·44	·46	·46
29		·07	·02	·03	·06	·04	·02	·02	·05	·05	·04	·16	·05		·04	·05	·06	·08	·15	·12	·09	·09		·21	·25	·16
30		..	..	..	..	·01	..	·02	·02	·02	·03	·02	·02		·02	·02	·01	·03	·04	·03	·02	..		·02	·01	..
*	3·15	2·20	2·18	1·95	2·58	2·28	1·97	2·15	2·48	2·37	2·50	2·49	2·37		2·15	2·15	2·40	2·53	2·75	2·84	2·66	2·40		2·52	2·70	2·13
†	45·96	43·51	40·42	37·83	43·08	37·09	35·70	41·70	40·51	38·29	36·31	38·25	36·58		35·59	35·85	37·01	37·15	41·14	38·55	38·16	37·77		35·45	37·98	32·96

MONTHLY GAUGE.

RECORD CEASED.

RECORD CEASED.

The figures in this row [illegible] from January 1st.

† The totals from January 1st.

Daily Rainfall. *The 85 years (1816–1900) mean at Greenwich for November is 2·35 in.* **November, 1903.**

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	·20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	·17	·19	·19	·12	·17	·12	·23	..	·21	·24	·23	·22	·23	·16	·22	·20	·21	·19	·22	·23	·21	·22	·25	·54	·23	·20
3	..	..	..	..	..	..	..	·17	..	..	..	·07	..	..	..	..	..	..	·01	..	..	..	..	..	..	..
4	·02	..	..	..	..	..	..	..	..	·01	..	..	·01	..	..	·01	..	..	·01	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	·01	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	·02	·06	·09	·06	·07	..	·05	..	·07	·09	·13	·07	·06	·02	·05	·06	·06	·08	·08	·06	·06	·06	·10	·02	·06	·07
9	·07	·05	·03	·05	·02	·08	·03	·09	·01	·04	·03	·02	·03	·05	·03	·01	·01	·02	·02	..	·03	·07	·03	..	·05	·08
10	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11	·02	·02	·03	·02	·02	·01	·02	..	·02	·02	·02	·03	·02	..	..	·02	..	·02	·01	·02	·03	·01	·02	·02	·02	·04
12	..	·04	·05	·04	·04	·04	·05	..	·04	·06	·06	·06	·05	..	·04	·04	·05	·03	·05	·06	·06	·06	·08	·06	·06	·08
13	..	..	·01	..	..	..	..	·06	..	..	·01	·02	·01	..	·01	·02	·01	·02	..	·02	·01	..	..	..	..	..
14	·03	·03	·03	·04	·02	·02	·02	·03	·03	·05	·06	·05	·05	·02	·04	·04	·04	·05	·07	·04	·04	·05	·04	·02	·02	·03
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	·01	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
17	·06	·07	·06	·05	·06	·04	·05	·08	·07	·05	·07	·06	·07	·05	·06	·09	·07	·07	·06	·05	·06	·07	·04	·05	·04	·07
18	..	..	..	..	..	..	..	..	..	·01	..	·01	..	..	..	..	..	..	·01	..	..	..	..	..	..	..
19	..	..	·01	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..
20	..	·02	·01	·02	·01	..	·01	..	·02	..	·01	·01	·02	..	·01	..	..	..	·01	..	..	·02	·01	..	..	..
21	..	..	..	..	..	..	..	..	·02	..	..	·01	..	..	..	·01	..	..	..	..	..	..	..	..	·01	·01
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	·06	·02	·04	·03	·04	..	·03	..	..	·05	·05	·04	·04	..	·03	·03	·04	·04	·03	·05	·03	·03	·06	·06	·05	·04
24	·02	..	·03	·02	..	·04	·03	·09	·05	..	..	..	..	·01	..	·03	..	·01	·01	..	·01	·02	..	..	..	·04
25	..	..	..	..	..	..	..	..	·01	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..
26	..	·08	·06	·06	·06	·01	·07	·01	·05	·02	·04	·09	..	..	·05	·03	·03	·02	·02	·02	·02	·03	·05	·02	·05	·05
27	1·20	1·25	1·21	1·03	1·24	·53	1·13	·25	1·20	1·05	1·10	·98	1·11	·92	1·07	·78	·82	·97	·97	·64	·93	1·01	1·10	1·00	1·04	1·12
28	·44	·47	·43	·42	·40	·53	·39	1·09	·27	·30	·26	·30	·25	·19	·22	·20	·26	·18	·22	·30	·28	·35	·38	·31	·36	·39
29	·08	·08	·08	·10	·06	·30	·04	·32	·03	·02	·02	·01	·03	..	·02	·03	·01	·01	·03	·02	·02	·05	·01	..	·02	·05
30	·02	·03	·04	·03	·03	..	·02	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·02
*	2·21	2·41	2·40	2·09	2·26	1·72	2·17	2·40	2·11	2·01	2·10	2·05	2·01	1·42	1·85	1·61	1·61	1·71	1·84	1·51	1·79	2·05	2·17	2·10	2·01	2·29
†	34·74	37·06	35·95	35·87	34·96	24·82	35·93	40·59	34·08	34·76	35·12	35·90	35·09	29·80	35·87	33·07	33·56	33·71	37·28	34·72	36·19	37·92	38·20	33·66	34·81	35·84

* The figures in this row give the totals for the month.

† The totals from January 1st.

Daily Rainfall. November, 1903.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	·01	..	..	..	..	..	..	..	..	..
2	·20	·19	·17	·14	·14	·18	·16	·14	·14	·22	·18
3	·01	..	·02	..	..	..	..	..	..	..	..
4	..	..	·01	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..
6	..	·01	..	..	..	..	..	..	..	..	..
7	..	..	·01	..	..	..	..	..	..	..	..
8	..	·07	·08	·02	·07	·05	·08	·06	·06	·05	·05
9	·12	·04	·05	·05	·03	·04	·06	·04	·02	·05	..
10	..	..	..	..	..	..	..	..	..	..	..
11	·03	·03	·02	..	..	·02	·02	·01	..	·02	·03
12	·08	·08	·08	·07	·07	·08	·08	·08	·06	·06	·06
13	..	..	..	..	..	..	..	..	..	..	..
14	·03	·04	·03	·02	..	..	·02	·02	·01	·05	·03
15	·01	..	·01	..	..	..	..	..	..	..	..
16	..	·01	..	..	..	..	..	..	..	..	..
17	..	·06	·07	·06	·07	·05	·06	·04	·03	·06	·04
18	..	·01	..	..	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..
20	..	·02	·02	·01	..	·01	·01	·01	..	·01	..
21	·08	..	..	..	..	..	·01	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	·02	·04	·04	·02	·05	·07	·03	·03	·02	..	·02
24	·04	..	·01	·01	..	..	..	·01	..	·04	..
25	..	..	..	..	..	..	..	..	..	..	..
26	·03	·04	·07	·03	..	·06	·05	·03	·01	·02	·01
27	1·07	1·10	1·09	1·08	1·18	1·06	·95	·92	·81	1·10	·83
28	·38	·32	·52	·41	·35	·39	·30	·28	·26	·38	·28
29	..	·02	·10	·12	·07	·05	·01	·02	·02	·03	..
30	·05	·01	·02	·01	·02	·06	·01	·01	..	..	..
*	2·15	2·10	2·42	2·05	2·05	2·12	1·85	1·70	1·44	2·09	1·53
†	33·82	33·89	37·17	32·27	32·86	34·68	34·27	31·83	28·72	36·64	29·76

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(November, 1903.)

The month has been mild, and open, with very little rain till towards the end. The rainfall is about half an inch below the average, whilst the mean temperature has been very variable, though, on the whole, about the average, by from one-half a degree to a degree. A queen wasp was seen at Wallington at 9.45 a.m. on the 2nd, and at Reigate at 5 p.m. on the 21st a small white butterfly was seen fluttering about in the garden. At Redhill the observer says "that quite a dozen different kinds of flowers were blooming in the garden up to the middle of the month, amongst them being asters and carnations, and a 'Gloire' rose opened on the 29th." Dahlias at Croydon were not cut till the 18th by the frost. Fog occurred generally during the first week, and also on the 18th and 19th. At Greenwich a brilliant orange glow at sunset was seen on the 5th and 6th. At Nutfield the observer says that "on the night of the 15th there were a great many shooting stars in all points of the compass; but between 5 and 6 a.m. on the 16th there was a splendid display of heaven's fireworks, mostly south-west. It was the finest display I have ever seen. There was a recurrence on the night of the 21st, but not nearly so continuous or so numerous." The month has been unhealthy, there having been some cases of small-pox, while diphtheria and scarlet fever cases were somewhat prevalent. The mean temperature of the month was at Wallington and Croydon (Duppas House) 44°·3, at Chipstead 44°·1, and at Warlingham and Worcester Park 43°·6. There were slight snow showers on the 29th and 30th. There were recorded at Wallington 42·2 hours of sunlight, which is 9·1 hours or three per cent. below the November average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

Day of Mo.	Holmbury St. Mary	Abinger (Rectory)	Abinger (The Hall)	Dorking (Denbies)	Redhill (Oxfordrd.)	Redhill (Linkfd.la.)	Nutfield (old gauge)	Nutfield (newgauge)	Buckland	ReigateHill	Upper Gatton	Merstham	Harp's Oak Cottage	Chipstead	Chaldon	Caterham	Westerham (Hill Est.)	Westerham (Town)	Knockholt (field gau.)	Knockholt (tower ga.)	Chevening Park	Sevenoaks	Chelsham	Warlingham	Kenley	Sanderstead
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..			..	..		..	..	..
3	·50	·51	·41	·37	·27	·27	·18	·24	·25	·23	·31	·24	·29	·33	·27	·27	·19	·17			·17	·13		·26	·22	·23
4	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..			..	..		..	·01	·01
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	·01	..
6	..	..	..	..	..	..	·01	·01	..	..	·01	..	..	·01	..	..	..	..			..	..		..	..	·01
7	·46	·35	·38	·38	·23	·22	·15	·25	·26	·21	·26	·20	·25	·33	·24	·14	·26	·27			·28	·30		·33	·32	·28
8	·29	·31	·32	·32	·21	·28	·22	·27	·19	·20	·28	·24	·26	·28	·25	·27	·25	·23			·17	·26		·30	·29	·24
9	·45	·41	·46	·50	·47	·40	·37	·43	·42	·48	·39	·40	·43	·61	·41	·45	·33	·25			·36	·18		·46	·38	·35
10	·39	·53	·55	·59	·39	·41	·38	·43	·46	·40	·41	·40	·43	·47	·41	·40	·51	·70			·72	·66		·49	·46	·50
11	·22	·24	·25	·15	·20	·16	·15	·16	·16	·15	·17	·14	·18	·24	·12	·16	·22	·23			·19	·29		·18	·22	·17
12	·32	·38	·50	·38	·37	·40	·37	·41	·33	·32	·38	·36	·41	·41	·40	·36	·24	·19			·23	·14		·40	·40	·36
13	·06	·07	·07	·07	·06	·06	·06	·10	·03	·03	·05	·07	·05	·05	·07	·09	·11	·12			·11	·07		·09	·07	·07
14	..	..	..	..	..	..	..	..	..	..	..	..	·01	·01	..	·01	..	..			..	·01		..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
16	..	..	..	..	..	·01	·01	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
17	·02	..	..	..	·01	..	..	..	..	·02	·01	..	·01	·01	..	..	..	..			·01	..		..	..	..
18	..	·02	·03	..	..	·02	·01	·01	·01	..	..	..	..	..	..	·01	·02	·02			·02	..		·01	·01	·01
19	·04	..	·07	·08	·02	..	..	..	·01	·03	·02	..	·01	..	..	..	..	..			..	·02		·01	·01	..
20	..	·03	..	..	..	..	..	..	..	..	..	..	..	·02	..	·01	..	..			..	..		..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
22	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
23	..	..	..	..	..	..	..	..	·01	..	..	..	..	·01	..	..	..	..			..	..		..	..	..
24	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..			·01	..		..	..	..
25	·01	·02	·04	·02	·01	·01	·01	·01	..	..	·01	·01	·01	..	..	..	·01	..			..	·03		..	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	·02			·01	..		..	·02	·03
27	·02	·03	·05	·03	·02	·01	·02	·02	·01	·02	·03	·03	·03	..	..	·05	..	·02			·02	·02		·06	·04	·05
28	..	..	..	..	..	..	..	..	..	..	..	..	·01	·05	·04	·01	..	..			..	..		..	·01	·01
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			..	..		..	..	..
*	2·79	2·90	3·13	2·89	2·26	2·25	1·94	2·34	2·15	2·09	2·33	2·09	2·40	2·83	2·21	2·24	2·14	2·22	2·31	1·71	2·30	2·11	2·50	2·59	2·47	2·32
†	47·85	48·73	48·60	50·04	40·99	42·12	40·07	41·49	37·70	40·82	45·25	42·76	43·38	45·31	43·91	46·78	42·78	42·84	43·93	34·38	46·17	41·92	43·11	46·65	42·09	40·14

MONTHLY GAUGE. MONTHLY GAUGE. MONTHLY GAUGE.

* The figures in this row give the totals for the month. † The totals from January 1st.

Day of Mo.	Burgh Heath	Leather-head	D'Abernon Chase	Oxshott	Banstead	Sutton	Benhilton	Carshalton	Wallington	Bedding-ton	Croydon (Brim. Bn.)	Croydon (Wn.N.rd.)	Croydon (Dup. H.)	Croydon (Whitgift)	Croydon (Wdml.rd.)	Croydon (Park Hill)	Croydon (Ashbn rd.)	Addington Hills	Addington (Park Fm.)	Addington (Pump. St.)	West Wickham	Hayes	Farn-borough	Orpington	Farming-ham Hill	Southfleet
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
2		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
3		·23	·20	·20	·32	·30	·14	·17	·17	·17	·15	·15	·15		·14	·15	·16	·21	·27	·23	·22	·25		·15	·14	·10
4		·01	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
5		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	·01	..	..		..	·01	..
6		..	..	..	·02	..	..	..	·01	..	..	..	·01		..	..	..	·01	..	..	..	..		..	..	..
7		·25	·20	·18	·35	·30	·25	·37	·30	·31	·29	·32	·29		·27	·24	·30	·24	·31	·31	·30	·32		·27	·32	·25
8		·30	·23	·18	·34	·22	·18	·23	·22	·21	·20	·22	·21		·19	·19	·15	·21	·16	·25	·20	..		·20	·17	·14
9		·35	·19	·20	·35	·27	·22	·30	·26	·31	·38	·42	·47		·40	·48	·45	·32	·49	·44	·40	·54		·38	·33	·21
10		·48	·38	·31	·91	·56	·39	·56	·50	·47	·44	·43	·41		·41	·41	·40	·44	·44	·43	·47	·45		·50	·54	·57
11		·17	·14	·12	·16	·14	·10	·14	·15	·12	·12	·16	·17		·11	·10	·11	·16	·14	·13	·09	·11		·16	·18	·17
12		·49	·50	·43	·45	·38	·36	·38	·35	·32	·26	·30	·30		·25	·28	·26	·30	·34	·31	·27	·24		·23	·18	·16
13		·07	·09	·07	·07	·05	·05	·05	·06	·05	·04	·04	·05		·04	·04	·06	·07	·07	·09	·07	·09		·10	·05	·04
14		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
15		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
16		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
17		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	·01
18		..	..	..	..	..	..	..	·01	·01	..	·01	·01		·01	·01	·02	·02	·01	·01	·01	·03		..	..	..
19		·05	·06	·05	..	·02	·01	·03	·02	..	..	..	..		..	..	·01	·02	..	..	..	..		..	·01	·01
20		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	..		..	..	..
21		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
22		..	..	..	·03	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
23		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	..		..	..	..
24		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
25		..	·01	..	..	..	..	..	..	..	..	..	..		..	..	..	·01	..	..	..	..		..	·01	·03
26		..	..	·01	..	·01	·01	..	·01	..	·02	·01	·01		..	·09	·02	·03	·04	..	..	..		·02	·03	·03
27		·06	·06	·05	·07	·06	·10	·13	·07	·08	·07	·08	·08		·09	..	·09	·05	·07	·07	·08	·09		·05	·07	·07
28		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	·01	·01	..	..	..		..	·01	..
29		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
30		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
31		..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	..
*	2·60	2·46	2·06	1·80	3·07	2·31	1·81	2·36	2·13	2·05	1·97	2·14	2·16		1·91	1·99	2·03	2·12	2·35	2·28	2·11	2·12		2·06	2·05	1·79
†	48·56	45·97	42·48	39·63	46·15	39·40	37·51	44·06	42·64	40·34	38·28	40·39	38·74		37·50	37·84	39·04	39·27	43·49	40·83	40·27	39·89		37·51	40·03	34·75

MONTHLY GAUGE.

RECORD CEASED.

RECORD CEASED.

* The figures in this row show the totals for the month.

† The totals from January 1st.

* The figures in this row give the totals for the month. † The totals from January 1st.

The 55 years (1848–1902) mean at Greenwich for December is 1·96 in.

Day of Mo.	Chislehurst	Bickley	Bromley	Bromley Common	Beckenham	Anerley	South Norwood	Beddington Corner	Morden	Wimbledon (Sew. Wks.)	Wimbledon (The Downs)	Wimbledon (Windmill)	Raynes Park	New Malden	Worcester Park	Esher	West Molesey	Surbiton	Kingston	Richmond	Putney Heath	Wandsworth Common	Clapham Park	Streatham	West Norwood	Upper Norwood
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	·14	·13	·12	·09	·12	·06	·12	..	·11	·15	·15	·16	·13	·12	·16	·16	·18	·14	·20	·16	·16	·15	·15	·11	·10	·11
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	·02	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	·01	..	..
7	·23	·26	·20	·32	·23	·20	·19	..	·15	·10	·14	·13	·16	·10	·16	·14	·19	·15	·17	·12	·15	·11	·15	·07	·18	·17
8	·15	·15	·14	·16	·15	..	·16	·30	·20	·14	·16	·16	·16	·13	·14	·16	·17	·15	·18	·17	·16	·17	·16	·11	·15	·18
9	·30	·29	·29	·33	·37	·25	·35	·39	·15	·16	·18	·15	·19	·14	·23	·17	·24	·21	·24	·18	·15	·19	·18	·18	·21	·24
10	·44	·39	·38	·45	·42	·50	·37	·64	·35	·35	·35	·35	·35	·26	·36	·38	·45	·33	·36	·29	·35	·34	·33	·34	·40	·40
11	·16	·14	·15	·13	·12	·04	·11	·08	·15	·10	·08	·07	·09	·08	·10	·14	·07	·12	·16	·11	·06	·11	·08	·08	·07	·09
12	·16	·17	·19	·20	·18	·16	·21	·04	·10	·17	·21	·21	·24	·15	·34	·28	·20	·22	·20	·23	·22	·19	·20	·15	·14	·16
13	·07	·05	·04	·07	·05	·03	·03	·28	·09	·02	..	·02	·04	·07	·05	·07	·06	·04	·04	·03	·03	·03	·03	·01	·02	·03
14	..	..	..	..	..	..	..	·04	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	·02	·02	·03	..	·01	·01	..	·01	·01	..	..	..	..	..	..	..	..	..	..	·02	·01	·02	..	·01	·03
19	..	..	..	..	..	..	..	·01	·01	·01	·04	·04	·05	·02	·04	·06	·05	·04	·04	·04	·04	·01	·01	..	·01	..
20	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·01	..	..	..	..	..	..
26	·02	·02	·02	..	..	..	..	..	·03	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	·08	·10	·10	·08	·09	·06	·08	·02	..	·03	·03	·04	·04	..	·05	·03	·02	·02	·03	·05	·04	·04	·05	·05	·03	·02
28	..	..	·01	·02	·02	..	..	·08	..	..	·01	..	..	..	..	..	..	..	..	·01	·01	·01	·01	..	·01	·04
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*	1·75	1·72	1·67	1·88	1·75	1·31	1·63	1·88	1·36	1·26	1·35	1·34	1·45	1·07	1·63	1·59	1·63	1·43	1·63	1·40	1·39	1·36	1·37	1·11	1·33	1·47
†	36·49	38·78	37·62	37·75	36·71	26·13	37·56	42·47	35·44	36·02	36·47	37·24	36·54	30·87	37·50	34·66	35·19	35·14	38·91	36·12	37·58	39·28	39·57	34·77	36·14	37·31

* The figures in this row give the totals for the month. † The totals from January 1st.

Daily Rainfall. December, 1903.

Day of Mo.	Forest Hill (Dartm.rd.)	Forest Hill (S&VWC)	Sidcup	Wilmington	Dartford	Eltham	Greenwich	Deptford	Nunhead	Brixton	Battersea
	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	..	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..
3	·11	·15	·11	·07	·10	·14	·08	·07	·04	·12	·09
4	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..
6	..	..	·01	..	..	..	..	..	..	..	..
7	·15	·15	·18	·21	·18	·15	·12	·11	·08	·16	..
8	·16	·16	·17	·14	·13	·16	·15	·14	·12	·14	·10
9	·26	·24	·30	·30	·42	·28	·27	·23	·13	·20	·15
10	·40	·38	·42	·43	·43	·43	·38	·40	·32	·32	·30
11	·07	·07	·18	·08	·07	·17	·06	·05	·04	·08	·05
12	·14	·13	·14	·13	·11	·12	·14	·12	·13	·20	·17
13	·02	·02	·06	·04	·03	·03	·01	·01	·02	·02	·01
14	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	..	..	..	..
16	..	·01	..	..	..	..	..	..	..	..	..
17	..	..	·01	..	..	..	·01	..	..	..	..
18	·03	..	·01	..	..	·01	..	·01	..	·02	..
19	..	·01	·02	..	..	..	..	·01	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..
26	..	..	..	·04	..	..	..	..	..	..	..
27	·05	·03	·15	·09	·19	·05	·03	·02	·02	·03	·02
28	..	·01	·03	·02	..	·04	·02	·01	..	·02	..
29	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..	..	..
*	1·39	1·36	1·79	1·55	1·66	1·58	1·27	1·18	·90	1·31	·89
†	35·21	35·25	38·96	33·82	34·52	36·26	35·54	33·01	29·62	37·95	30·65

Note.—The observations are taken at 9 a.m., except at Redhill (Oxford Road), Reigate Hill, Croydon (Ashburton Road), Addington (Park Farm), and Brixton (8 a.m.), Sevenoaks (10 a.m.), and Beddington Corner (7 p.m.).

NOTES.

(December, 1903.)

The month was cold at the beginning and end, and very mild about the middle. As instances of the warmth, Mr. Malden writes that "quite a fair specimen of a Gloire was picked on Christmas Day"; and Mr. Horner says, "In the second week I gathered in my garden here a perfect specimen of a rose and several primroses and pansies; strawberries also bloomed and set fruit." There was a dense black fog throughout the district on the 5th. On the night of the 9th there was heavy hail at Redhill, and on the 11th there was thunder and hail in most places in the district. At Greenwich there was granular snow on the 27th and 28th, and there was sleet generally throughout the district on the 27th. Solar halos were seen at Greenwich on the 1st and 2nd, and at Upper Gatton on the 2nd and 3rd, and a lunar one was seen at Greenwich and Sidcup on the 1st; and on the 29th at Croydon a small iridescent one was observed. Colds and coughs are very prevalent, and scarlet fever of a mild type is somewhat widely diffused. The mean temperature of the month is slightly below the average, and was at Wallington and Croydon (Duppas House) 38°·5, at Worcester Park 38°·2, at Chipstead 37°·2, and at Warlingham 37°·0. There were recorded at Wallington 28·3 hours of sunlight, which is 10·6 hours or four per cent. below the December average of the fifteen years 1886–1900.

F. Campbell-Bayard, F.R.Met.Soc.,
Hon. Sec.

APPENDIX II.

Falls of 1 Inch and Upwards.

January 4th.—Bromley Common, 1·02 in.

May 30th.—Beddington Corner, 3·67 in.; Wallington, 3·13 in.; Beddington, 2·29 in.; Wimbledon (Sewage Works), 2·26 in.; Croydon (Waddon New Road), and Croydon (Duppas House), 1·85 in.; Wandsworth Common, 1·82 in.; Croydon (Windmill Road), 1·60 in.; Carshalton, 1·50 in.; Croydon (Whitgift), 1·46 in.; Richmond, 1·34 in.; Croydon (Brimstone Barn), and Croydon (Park Hill), 1·32 in.; Morden, 1·15 in.; Streatham, 1·14 in.; Putney Heath, 1·13 in.; Dorking, 1·02 in.

June 10th.—Carshalton, 3·17 in.; Banstead, 1·86 in.; Croydon (Waddon New Road), 1·85 in.; Wallington and Worcester Park, 1·82 in.; Addington (Park Farm), 1·81 in.; Croydon (Brimstone Barn), 1·78 in.; D'Abernon Chase, 1·77 in.; Beddington, 1·76 in.; Sanderstead, Benhilton, Croydon (Whitgift), Croydon (Windmill Road), and Croydon (Park Hill), 1·75 in.; Sutton and Croydon (Ashburton Road), 1·74 in.; Croydon (Duppas House), 1·72 in.; Kenley, 1·70 in.; Addington (Pumping Station), 1·67 in.; Oxshott, 1·63 in.; Esher, 1·62 in.; Surbiton, 1·60 in.; Addington Hills, 1·59 in.; Hayes, 1·58 in.; West Molesey, 1·56 in.; Warlingham, 1·52 in.; Farnborough, 1·48 in.; Bromley Common, 1·45 in.; Kingston, 1·42 in.; Orpington, 1·40 in.; South Norwood, 1·37 in.; Raynes Park, 1·34 in.; Chipstead and New Malden, 1·33 in.; Bromley, 1·30 in.; West Wickham, 1·25 in.; Wimbledon (The Downs), 1·24 in.; Chevening Park, 1·23 in.; Beckenham, 1·22 in.; Caterham, 1·21 in.; Putney Heath, 1·19 in.; Wimbledon (The Windmill), 1·17 in.; Upper Norwood, 1·16 in.; Chaldon and Bickley, 1·15 in.; Harp's Oak Cottage, 1·13 in.; Merstham, 1·12 in.; Leatherhead and West Norwood, 1·11 in.; Wandsworth Common, 1·10 in.; Westerham (Hill Estate), 1·09 in.; Sevenoaks, 1·07 in.; Upper Gatton, 1·04 in.; Wimbledon (Sewage Works), 1·03 in.; Richmond, 1·01 in.; Reigate Hill, 1·00 in.

June 11th.—Beddington Corner, 1·79 in.; Dorking, 1·07 in.; Chipstead and Caterham, 1·05 in.; Chaldon, 1·02 in.; Nutfield (new gauge), 1·01 in.

June 13th.—Richmond, 1·55 in.; Carshalton, 1·40 in.; Kingston, 1·24 in.; Croydon (Ashburton Road), 1·22 in.; Croydon (Park Hill) and Bickley, 1·20 in.; Croydon (Waddon New Road), 1·12 in.; Croydon (Whitgift), Chislehurst, and Bromley, 1·10 in.; Croydon (Duppas House), 1·09 in.; Croydon (Brimstone Barn), 1·08 in.; Addington (Park Farm), Hayes, and Beckenham,

1·06 in.; Croydon (Windmill Road), 1·05 in.; Dorking, Wallington, Bromley Common, and New Malden, 1·04 in.; Brixton, 1·03 in.; West Wickham, 1·02 in.; Southfleet and Wandsworth Common, 1·00 in.

June 14th.—Croydon (Brimstone Barn), 1·88 in.; Dartford, 1·24 in.; Nunhead, 1·22 in.; Eltham, 1·20 in.; Greenwich, 1·18 in.; Forest Hill (S. & V. Water Co.) and Deptford, 1·17 in.; Brixton, 1·15 in.; Forest Hill (Dartmouth Road), 1·12 in.; Leatherhead, 1·11 in.; Croydon (Waddon New Road), Bickley, and Battersea, 1·10 in.; Chipstead, 1·07 in.; Upper Gatton, Chislehurst, and Clapham Park, 1·06 in.; Wandsworth Common, 1·05 in.; Chaldon and Putney Heath, 1·04 in.; Addington (Park Farm), Bromley, and Richmond, 1·03 in.; Beckenham, 1·02 in.; Carshalton and Upper Norwood, 1·01 in.; Harp's Oak Cottage and West Norwood, 1·00 in.

June 15th.—Anerley, 1·40 in.; Beddington Corner, 1·38 in.

June 19th.—Abinger (The Hall), 1·01 in.; Abinger (Rectory), 1·00 in.

July 17th.—Clapham Park, 1·75 in.; Streatham, 1·62 in.; Worcester Park, Kingston, and Wandsworth Common, 1·61 in.; Brixton, 1·50 in.; Wimbledon (Sewage Works), 1·48 in.; Raynes Park, 1·30 in.; Wimbledon (The Downs), 1·28 in.; Richmond, 1·11 in.; New Malden, 1·10 in.; Battersea, 1·05 in.; Sevenoaks, 1·02 in.; Putney Heath, 1·00 in.

July 18th.—Banstead, 1·00 in.

July 19th.—Nutfield (new gauge), 1·71 in.; Leatherhead, 1·61 in.; Nutfield (old gauge), 1·48 in.

July 23rd.—Dartford, 4·41 in.; Wilmington, 4·03 in.; Sidcup, 3·94 in.; Farningham Hill, 3·78 in.; Southfleet, 3·54 in.; Chislehurst, 3·25 in.; Bickley, 3·21 in.; Orpington, 3·16 in.; Greenwich, 3·15 in.; Bromley, 2·84 in.; Eltham, 2·68 in.; Farnborough, 2·63 in.; Bromley Common, 2·60 in.; Deptford, 2·48 in.; Hayes, 2·45 in.; Chevening Park, 2·39 in.; Westerham (The Town), 2·20 in.; Beckenham, 2·19 in.; Sevenoaks, 2·15 in.; Westerham (Hill Estate), 2·01 in.; West Wickham, 1·81 in.; Forest Hill (S. & V. Water Co.), 1·73 in.; Forest Hill (Dartmouth Road), 1·70 in.; Addington (Park Farm) and Upper Norwood, 1·68 in.; South Norwood, 1·67 in.; Clapham Park, 1·62 in.; Addington (Pumping Station), 1·58 in.; Croydon (Ashburton Road), 1·56 in.; Addington Hills, West Norwood, and Nunhead, 1·55 in.; Croydon (Waddon New Road) and Brixton, 1·53 in.; Sanderstead, 1·47 in.; Croydon (Park Hill), 1·46 in.; Streatham, 1·42 in.; Croydon (Duppas House) and Croydon (Windmill Road), 1·41 in.; Croydon (Brimstone Barn) and Croydon (Whitgift), 1·40 in.; Beddington and Wandsworth Common, 1·38 in.; Wallington, 1·34 in.; Wimbledon (Sewage Works), 1·32 in.; Wimbledon (The Windmill) and Putney Heath,

1·27 in.; Warlingham, 1·24 in.; Kenley, 1·22 in.; Holmbury St. Mary and Kingston, 1·19 in.; Caterham and Benhilton, 1·18 in.; Carshalton and Wimbledon (The Downs), 1·17 in.; Merstham, 1·16 in.; Abinger (Rectory) and Sutton, 1·15 in.; Mordon, 1·14 in.; Raynes Park, 1·13 in.; Richmond, 1·12 in.; Banstead, 1·11 in.; Battersea, 1·09 in.; New Malden, 1·08 in.; Chipstead, 1·06 in.; Buckland, 1·05 in.; Chaldon, 1·04 in.; Worcester Park, 1·03 in.; Abinger (The Hall), 1·02 in.; West Molesey and Surbiton, 1·01 in.

July 24th.—Beddington Corner, 1·29 in.

July 25th.—Eltham, 1·56 in.; Banstead, 1·14 in.; Wandsworth Common, 1·09 in.; Battersea, 1·01 in.; Clapham Park, 1·00 in.

July 26th.—Beddington Corner, 1·45 in.

July 29th.—Reigate Hill, 1·10 in.

August 11th.—Carshalton, 1·50 in.; Bickley, 1·27 in.; Croydon (Ashburton Road), 1·36 in.; Abinger (Rectory), Bromley, and South Norwood, 1·25 in.: Beckenham, 1·24 in.; Holmbury St. Mary 1·22 in.; Banstead, Sidcup, and Eltham, 1·20 in.; Dorking, 1·18 in.; Abinger (The Hall) and Wallington, 1·17 in.; Greenwich, 1·15 in.; Addington Hills, Addington (Park Farm), and West Wickham, 1·14 in.; Nunhead, 1·13 in.; Chislehurst and Upper Norwood, 1·12 in.; Chipstead and Beddington, 1·10 in.; Croydon (Park Hill), 1·09 in.; Warlingham and Croydon (Duppas House), 1·08 in.; Forest Hill (Dartmouth Road), 1·07 in.; Kenley, Croydon (Windmill Road), Hayes, and Bromley Common, 1·06 in.; Croydon (Waddon New Road), 1·05 in.; Forest Hill (S. & V. Water Co.), 1·04 in.; Sutton, Farnborough, and Dartford, 1·03 in.; Brixton, 1·02 in.; Redhill (Oxford Road), Nutfield (new gauge), Caterham, and Deptford, 1·00 in.

August 17th.—Caterham, 1·50 in.

August 18th.—Westerham (The Town), 1·08 in.

August 24th.—Oxshott, 2·06 in.; Abinger (The Hall), 1·98 in.; D'Abernon Chase, 1·95 in.; Leatherhead, 1·87 in.; Abinger (Rectory), 1·70 in.; Carshalton, 1·65 in.; Dorking and Putney Heath, 1·60 in.; Wandsworth Common, 1·56 in.; Worcester Park, 1·55 in.; Wimbledon (The Windmill), 1·52 in.; Surbiton, 1·51 in.; New Malden, 1·46 in.; Raynes Park, 1·42 in.; Benhilton, 1·40 in.; Clapham Park, 1·39 in.; Wimbledon (The Downs), 1·38 in.; Holmbury St. Mary, 1·37 in.; Kingston, 1·33 in.; Streatham, 1·32 in.; Morden, 1·30 in.; Esher, 1·28 in.; Brixton, 1·27 in.; Battersea, 1·26 in.; Beddington Corner, 1·24 in.; Sutton, 1·21 in.; Wimbledon (Sewage Works), 1·20 in.; Banstead, 1·07 in.; West Norwood, 1·06 in.

September 4th.—West Molesey, 1·93 in.; Carshalton, 1·80 in.; Abinger (The Hall), 1·76 in.; Esher, 1·58 in.; Oxshott and

Kingston, 1·55 in.; Sutton, 1·53 in.; Morden, 1·51 in.; Dorking, 1·50 in.; Surbiton and Richmond, 1·48 in.; Holmbury St. Mary, 1·46 in.; D'Abernon Chase and Benhilton, 1·45 in.; Leatherhead, 1·42 in.; Banstead, 1·37 in.; Abinger (Rectory), 1·32 in.; New Malden, 1·30 in.; Raynes Park, 1·28 in.; Wimbledon (Sewage Works) and Worcester Park, 1·26 in.; Wallington, 1·25 in.; Clapham Park, 1·24 in.; Wimbledon (The Downs) and Putney Heath, 1·20 in.; Wandsworth Common and Brixton, 1·19 in.; Wimbledon (The Windmill), 1·15 in.; West Norwood and Battersea, 1·05 in.

October 11th.—Abinger (The Hall), 1·62 in.; Holmbury St. Mary, 1·60 in.; Dorking, 1·35 in.; Abinger (Rectory), 1·32 in.; Chipstead, 1·28 in.; Banstead, 1·26 in.; Upper Gatton, 1·21 in.; Warlingham, 1·16 in.; Caterham, 1·13 in.; Harp's Oak Cottage and Leatherhead, 1·12 in.; Chaldon, 1·11 in.; Buckland, 1·06 in.; Redhill (Oxford Road), 1·05 in.; Merstham, 1·02 in.; Reigate Hill, 1·01 in.; Westerham (Hill Estate), Chevening Park, and Croydon (Duppas House), 1·00 in.

October 12th.—Redhill (Linkfield Lane), 1·27 in.; Chevening Park, 1·14 in.; Caterham, 1·07 in.; Addington (Park Farm), 1·04 in.; Nutfield (old gauge), Nutfield (new gauge), and Westerham (The Town), 1·02 in.

October 25th.—Banstead, 1·08 in.; Carshalton, 1·07 in.

October 26th.—Caterham, 1·38 in.; Buckland and Warlingham, 1·36 in.; Harp's Oak Cottage, 1·25 in.; Merstham, 1·24 in.; Redhill (Oxford Road), 1·23 in.; Farnborough, 1·22 in.; Redhill (Linkfield Lane) and Beddington Corner), 1·21 in.; Chaldon and Addington (Pumping Station), 1·20 in.; Kenley and West Wickham, 1·15 in.; Addington (Park Farm), 1·14 in.; Bromley Common, 1·12 in.; Upper Gatton, 1·11 in.; Abinger (The Hall) and Dorking, 1·08 in.; Chipstead and Hayes, 1·06 in.; Abinger (Rectory), Sanderstead, and Bickley, 1·05 in.; Nutfield (old gauge), and Reigate Hill, 1·03 in.; Chislehurst, 1·00 in.

October 27th.—Abinger (The Hall), 1·02 in.; Abinger (Rectory), 1·00 in.

November 27th.—Harp's Oak Cottage and Chevening Park, 1·81 in.; Westerham (The Town), 1·80 in.; Upper Gatton and Chaldon, 1·76 in.; Caterham, 1·75 in.; Chipstead, 1·69 in.; Nutfield (new gauge), Reigate Hill, and Sevenoaks, 1·64 in.; Addington (Pumping Station), 1·63 in.; Redhill (Oxford Road), 1·62 in.; Holmbury St. Mary and Abinger (Rectory), 1·61 in.; Croydon (Brimstone Barn), 1·60 in.; Merstham and Westerham (Hill Estate), 1·59 in.; Nutfield (old gauge), 1·58 in.; Dorking, and Warlingham, 1·57 in.; West Wickham, 1·56 in.; Banstead, 1·49 in.; Kenley, 1·48 in.; Addington (Park Farm), 1·47 in.; Abinger (The Hall) and Buckland, 1·43 in.; Sanderstead and Orpington, 1·42 in.; Addington Hills, 1·40 in.; Croydon (Wad-

don New Road), 1·38 in.; Wallington, 1·36 in.; Farningham Hill, 1·34 in.; Beddington, 1·32 in.; Croydon (Ashburton Road), 1·31 in.; Sutton and Croydon (Duppas House), 1·30 in.; Croydon (Park Hill) and Bickley, 1·25 in.; Beckenham, 1·24 in.; Croydon Windmill Road), 1·23 in.; Bromley, 1·21 in.; Redhill (Linkfield Lane), Carshalton, Hayes, Chislehurst, and Morden, 1·20 in.; Dartford, 1·18 in.; Benhilton, 1·17 in.; Leatherhead, 1·16 in.; D'Abernon Chase, 1·15 in.; South Norwood, 1·13 in.; Upper Norwood, 1·12 in.; Raynes Park, 1·11 in.; Wimbledon (The Downs), Clapham Park, Forest Hill (S. & V. Water Co.), and Brixton, 1·10 in.; Sidcup, 1·09 in.; Wilmington, 1·08 in.; Worcester Park and Forest Hill (Denmark Road), 1·07 in.; Eltham, 1·06 in.; Wimbledon (Sewage Works), 1·05 in.; West Norwood, 1·04 in.; Bromley Common, 1·03 in.; Oxshott, Southfleet, and Wandsworth Common, 1·01 in.; Streatham, 1·00 in.

November 28th.—Beddington Corner, 1·09 in.

CROYDON BOURNE FLOWS.

By BALDWIN LATHAM,

Mem. Inst. C.E., Mem. Inst. M.E., F.G.S., F.S.S., F.R.Met. Soc., &c.

The Author in this paper proposes first to deal with the historical notices of Bourne flows, and then to pass on to the circumstances that give rise to Bourne flows, and to give particulars of some of the Bourne flows that have occurred at Croydon and its immediate neighbourhood.

Bourne flows in the neighbourhood of Croydon.

Croydon may be looked upon as a centre in the neighbourhood of which a number of Bourne flows have been recorded: for example, what is called the Croydon Bourne flowing down the Caterham Valley; the Bourne which makes its appearance at Marlpit Lane in the Brighton Road Valley at Smitham Bottom; a Bourne which used to flow in the Wickham Valley below Kent Gate; and Bourne flows which occur at Carshalton, Cheam, Nonsuch Park, and Epsom.

Early history of Croydon Bourne.

The early history of the Croydon Bourne flows is very much mixed up with those occurring in other parts of the country, and will be considered in connection with them. It is probable that a Bourne flow

recorded in other places than Croydon may mean that a Bourne was taking place at Croydon at the same period.

Superstition regarding Bourne flows.

All Bourne flows in earlier periods were viewed by some persons with much superstition, while other persons had a clear knowledge as to their cause.

Earliest record Warkworth's "Chronicle."

The earliest record the author has found referring directly to the Croydon Bourne flow is in Warkworth's "Chronicle," which is a chronicle of the first thirteen years of the reign of King Edward IV. (who began to reign on 4th March, 1461), by John Warkworth, D.D., Master of St. Peter's College, Cambridge. This "Chronicle" was published by the Camden Society in 1839, and the following is a quotation from pages 23 and 24 referring to Bourne flows:

Bourne flow, XIII. King Edward IV., 1472 or 1473

"In the same yere (XIII. of King Edward the 4th 1473)* Womere watere ranne hugely, withe suche abundaunce of watere, that nevyr manne sawe it renne so moche afore this tyme. Womere is callede the woo watere: for Englyschmen, whenne thei dyd fyrst inhabyde this lond, also sone as thei see this watere renne, thei knewe wele it was a tokene of derthe, or of pestylence, or of grete batayle; wherefor thei called it *Womere*; (for *we* as in Englysche tonge woo, and *mere* is called watere, whiche signyfieth woo-watere;) for alle that tyme thei sawe it renne, thei knewe welle that woo was comynge to Englonde. And this Wemere is vij myle frome Sent Albons, at a place callede Markayate; and this Wemere ranne at every felde afore specifyede, and nevere so hugely as it dyd this yere, and ranne stylle to the xiij day of June next yere folowynge. Also ther has ronne dyverse suche

* 1472 old style, 1473 new style

other wateres, that betokenethe lykewyse; one at Lavesham * in Kent, and another byside Canturbury called Naylborne and another at Croydone in Suthsex, and another vij myle a this syde the castelle of Dodley, in the place called Hungerevale; that whenne it betokennethe batayle it rennys foule and trouble watere; and whenne betokenythe derthe or pestylence, it rennyth as clere as any watere, but this yere it ranne ryght trouble and foule watere."

Leland's "Itinerary."

The Author has looked through Leland's "Itinerary" as likely to furnish information with reference to Bourne flows. This "Itinerary" was begun about the year 1538. There is only one reference to a Bourne flow, and that was the Bourne at Drelingore near Dover in Kent, and which has been flowing for a short time this year. In the third edition, volume 7, page 127, it is stated that: "Ther is also a great spring at a place cawlled . . . . . and that ones in a vi or vii Yeres brasteth owt so abundantly, that a great part of the water cummeth into Dovar Streme, but els yt renneth yn to the Se betwyxt Dovar and Folchestan, but nearer to Folchestan, that is to say withyn a ii Myles of yt."

Bourne at Drelingore.

"Topographe or Survey of the County of Kent," by Richard Kilburne of Hawkhurst, 1659.

In a book called "A Topographe or Survey of the County of Kent," by Richard Kilburne of Hawkhurst, published in 1659, under the head of Langley there is a statement that: "In the year 1472 in the park in this parish did newly break out the bourne or spring there." Under the head of Lewsham * it is stated that "at this parish (in the year 1472) a great spring newly break out."

Bourne at Langley in 1472.

Bourne at Lewisham in 1472.

Camden's "Britannia," 1695 edition.

In Camden's "Britannia," the first edition of which was published in 1586 and has gone through several

* Lewisham.

editions since, in the edition of 1695, page 159, the following quotation appears with reference to the Croydon Bourne flow:

"The Vandal* is augmented by a small river from the east which rises at Croydon formerly Cradiden, lying under the hills." "For the torrent that the vulgar affirm to rise here sometimes and to presage dearth and pestilence; it seems hardly worth so much as the mentioning, tho' perhaps it may have something of truth in it."

Garrow's "History of Croydon," 1818.

The above passage from Camden appears in Garrow's "History of Croydon," which was published in 1818.

Hertfordshire Bourne.

There is also mention of the Hertfordshire Bourne in Camden, pages 301 and 305.

"A certain brook near it (Watling Street) call[d] Wenmer,† which (as the vulgar believe) when ever it breaks out and swells higher than usual, always portends dearth or troublesome times."

"North-west from hence is Markat, or more truly Meergate, *i.e.* (says Norden) an issue or out-gale of water which seems to refer to the River Womer, mentioned by our author.‡ This is said to have broke out in the time of Edward 4, and to have run from the 19th February till the 14th June following."

Vipsies of Yorkshire.

Camden also refers to the Vipsies of Yorkshire, now called Gipseys, another name for a Bourne flow.

Childrey's "Britannia Baconica," 1661.

In Childrey's "Britannia Baconica, or the Natural Rarities of England, Scotland, and Wales," published in 1661, there are references to Bourne flows.

* The Vandal was the old name of the Wandle.

† It is also called Womer.

‡ "Nord," p. 20.

Joshua Childrey, D.D., was a divine and natural philosopher, born in 1623, and died in 1670, was rector of Upwey in Dorsetshire after the Restoration, and filled other offices in the Church.

Childrey. Wiltshire Bourne.

Under the head of Wiltshire he says:

"Sometimes there break out water in the manner of a sudden land flood, out of certain stones (that are like rocks) standing aloft in open fields near the rising of the River Kenet in this shire, which is reputed by the common people a forerunner of dearth. That the sudden eruption of springs in places where they use not always to run should be a sign of dearth is no wonder. For these unusual eruptions (which in Kent we call Nailbournes) are caused by extreme gluts of rain, or lasting wet weather, and never happen but in wet years (witness the year 1648 when there were many of them) in which years Wheat and most other grain thrive not well (for a plain reason) and therefore dearth succeeds the year following."

Nailbournes, Kent. Bourne due to rainfall.

Childrey. Croydon Bourne.

Under the head of Surrey he says:

"The rising of a bourn or stream near Croydon (as the common people hold) presageth death, as the plague; and it hath been observed to fall out so. The rising of Bourns in places where they run not alwayes, we have before proved to be caused by great wet years, which (according to Hippocrates' observation) are generally the most sickly; and if they prove hot as wel as wet (because heat and moisture are great disposers to putrefaction) they prove also malignant and for the most part pestilential. And the reason why the rising of this bourne doth not always presage the Plague, is because all wet years do not prove hot."

Causes and effects of Bournes.

Childrey. Hertfordshire Bourne.

Under the head of Hertfordshire he says:

"There is near St. Albans a brook called Wenmere, or Womere, which never breaketh out but it foretelleth dearth and scarcity of corn, or else some extraordinary dangerous times shortly to ensue, as the common people believe."

Childrey. Yorkshire Vipseys.

Under the head of Yorkshire, he says:

"Near Flamborough Head (saith Camden) it is reported that there are certain waters called Vipseys, which flow every other year out of blind springs, and run with a very violent stream through the low land, into the sea. They rise (they say) from many springs meeting together within the ground, which makes their stream so forcible on a sudden. When they are dry it is a good sign; but when they break out they say it is a certain sign of dearth to follow."

Richard Burton's "Admirable Curiosities, Rarities, and Wonders in England, Scotland, and Ireland," 1682.

In a book called "Admirable Curiosities, Rarities, and Wonders in England, Scotland, and Ireland," by R. B——, published in 1682, under the head of "Hartfordshire" he says: "There is a Brook near St. Albans called Wenmere or Womer which never breaketh out but it foretelleth scarcity of corn or else some extraordinary dangerous times to ensue as the vulgar believe."

Bourne near St. Albans.

Leland's "Itinerary," 3rd edition. Dr. Robert Plot.

In the second volume of Leland's "Itinerary," 3rd edition, page 168, a notice of Dr. Robert Plot's account of a designed journey through England and Wales is given, in which he speaks as matters for consideration,

Nailbourne near Canterbury.

"of the Nailbourn near Canterbury; a Rivulet which they have but once in seven or ten years, it's Channel is always apparent and has a bridge or two over it, but there never runs any water (though there fall great Rains) but once in seven or ten years which is a notorious Truth."

Dr. Robert Plot in his "Natural History of Oxfordshire," published in 1677, says, pages 29-30:

Dr. Robert Plot's "Natural History of Oxfordshire," 1677.

"That *Land-springs* and such as run but once perhaps in many years, have their rise and continuance from plentiful showers, I think we have little reason to doubt, since we have them not at all, or but very weak in any Summer, or the dryer Winters: such are those that foretell (and naturally enough) the scarcity and dearness of Corn and Victuals; whereof that of *Assenton,* near *Henly* upon *Thames* is one of the most eminent that I know of in England; and no question is the same mentioned by *Johannes Euseb Nierembergius,* in his book (as he calls it) of the *Miracles of Nature.* By which, I suppose, he must mean the *Chiltern* Country of *Oxfordshire, there are,* says he, *many Springs which in fertile years are always dry; but before any defect, as the Harbingers of an approaching dearth, these waters get loose, and as it were breaking prison they quickly unite into a forcible stream.* And so they did lately, An 1674, with that violence that several mills might have been driven with the Current; and had not the town of *Henly* made some diversion for them, their *Fair Mile* must have been drowned for a considerable time. Of these there are many in the County of *Kent,* which I know not for what reason they call *Nail-bourns* there, and prescribe them (some will) a certain time for their running as once in seven, ten or fifteen years. But the certain natural principle of such Springs altogether depending upon an uncertain cause, no heed is to be given to such kind of stories, they being equally as vain as the persons that broach'd them."

Land springs.

Assenton Bourne.

Bournes of Chilton, County of Oxfordshire.

Many Nail-bournes in Kent.

In Harris' "History of Kent," published in 1719, reference is made to several Bourne flows, for instance:—

Harris' "History of Kent," 1719.

Drelingore Bourne (Alkham).

Alkham. "In this parish is an Eylebourn rising in a bottom, at a place called Dillingdore*, whose Irruption the Inhabitants will have to be certain presage, either of some great Mortality, or Dearth and Scarcity of Provisions. Indeed from no apparent Head or Spring, it sends out sometimes such vast Quantities of water, that a Vessel of considerable burden may be borne by the Stream, which usually goes down to Chilton, and so by the Dover River finds an outlet into the sea."

Bourne flow Langley, near Maidstone, 1472.

Langley.† "The spring or bourn here in the Park did newly break out of the Earth in the year 1472 as did another the same year in Lewesham."

Bourne flow, Lewisham, 1472.

Then he refers to Addington, near Maidstone, and says:

Addington, near Maidstone, Bourne flow.

"Here is an Eyle-bourn at this place which people call Ere-well, breaking out once in Seven or Eight years, which they will have to presage Deaths and Dearths, and I know not what. When it comes they dig a Dyke for it and turn it along by the Highway-side; and when the water mingles with that of their little Trout Rivulet it makes these Trouts Red, which otherwise are White."

Lewisham Bourne, 1472.

He also says: An Eylebourn or Nailbourne broke out in 1472 at Lewsham.

Ospringe Bourn, 1674.

Ospringe. "In February 167$\frac{3}{4}$ one began here but dried up before Michaelmas following, and another arose in February 1712 about a hundred yards above the Spring-Head and with so great a stream as that it was troublesome to the Road and the Surveyors of the Highways were forced to cut through several pieces of

* Now called Drelingore.

† Near Maidstone.

land to convey the Water away. But this Eylebourn also was gone by Michaelmas."

Petham Bourne.

He also says: "A famous Eylebourn which rises in this parish (Petham) which runs a little way before it falls into the ground; whence perhaps came the parish's name Petham, the place of the Pit or Hole; But now and then it goes with a very strong stream, quite down into the Greater Stoure at Shanford Bridge."

Aubrey's "Surrey," 1723.

In Aubrey's "Natural History and Antiquities of the County of Surrey," published 1723, vol. iii., page 17, he says, under the head of Caterham or Katerham: "Between this place and Coulsdon, in the Bottom commonly called Stoneham Lane, issues out sometimes (as against any change in our English Government) a Bourn, which overflows, and runs down in Smitham Bottom to Croydon. This is held by the inhabitants and neighbourhood to be ominous, and prognosticating something remarkable approaching as it did before the happy Restoration of King Charles the Second of ever glorious memory in 1660. Before the Plague of London in 1665, and in 1688 the Æra of another change of the Constitution."

No doubt this Bourne refers to the Bourne which usually breaks out now from the Merstham Tunnel and disappears in the ground at Red Lion Green, Smitham Bottom.

Croydon Bourne.

At page 47 he also refers to the Croydon Bourne as follows: "A little below, in a grove of Ew-trees, within the Manor of Westhall in the Parish of Warlingham as I have frequently heard, rises a Spring, upon the Approach of some remarkable alteration in Church or State, which runs in a direct Course between Little Hills, to a place called Foxley Hatch and there di-

appears and is no more visible till it rises again at the end of Croydon Town near Haling-Pound, where with great rapidity it rushes into the river near that Church. I must not here forget to observe, that the part of this county where this rises and passes along is so very dry that the Rusticks are obliged to drive their cattle a great Way for water. It began to run a little before Christmas, and ceased about the end of May at that glorious Æra of English Liberty the year 1660. In 1665 it preceded the Plague in London and the Revolution in 1688."

Hasted's "History of Kent," 1798.

In Hasted's "History of Kent," published in 1798 by Edward Hasted, F.R.S. and S.A., there are several references to Bourne flows as at Bishopsbourne, Kingston adjoining Bishopsbourne, and Barham. He also describes a nailbourne that rises from some springs at Drelingore "which" (he says) "in very wet and windy weather increase to the height of ten feet and run through the lands to the head of the River Dour at Chilton, commonly beginning in February and ending in March or April, at which time the wells of fifteen or sixteen fathom depth are full; and the country people entertain a notion that this water has a subterraneous communication with the waters called Liddon Spouts in the cliffs at Hougham at least four miles from hence."

Bournes at Bishopsbourne, Kingston, Barham, and Drelingore.

Liddon Spout.

He refers again to Lyden Spouts and the belief that the Nailbourne at Drelingore in Alkham communicates subterraneously with these spouts.

Great storm in Canterbury 1272.

He further says that in Canterbury in 1272 there occurred: "A great storm of thunder and lightning, and a sudden inundation; the waters breaking forth seemingly from the caverns of the earth, overflowed the greatest part of the city where they were never before known to come."

Whether this was really a true Bourne flow or a flood there may be some doubt, as, on the 8th January, 1776, he describes another flood at Canterbury. Both of these floods did much damage in washing down houses and causing considerable loss of life.

Storm in Canterbury 1776.

He also says: "There is a nailbourne or temporary land spring such as are usual in the parts of this country eastward of Sittingbourne, which run but once perhaps in several years then failing and continuance having no active periods, the breaking forth of them being held by the common people to be a forerunner of scarcity and dearness of corn and victuals. This at Ospringe when it breaks out rises about half a mile southward of Whitehill, near Kennaways in the road to Stalisfield, and joining the above mentioned rivulet, which it considerably increases, flows with it into Faversham Creek. In February 1674, it began to run but stopped before Michaelmas. It broke forth in February 1712 and ran with such violence along the high road, that trenches were cut through the lands adjoining to carry the water off, but it stopped again before Michaelmas. It had continued dry till it broke out afresh in 1753, and continued to run till Summer 1778 when it stopped and has continued dry ever since."

Ospringe in 1674 and 1712.

Ran from 1753 to 1778.

He also says, referring to Boughton under Blean, that the westernmost of the two streamlets flowing in this place is a nailbourne. He also mentions the nailbournes of Liminge, Drelingore (Alkham), Addington near Maidstone, and at Petham.

Nailbournes Boughton under the Blean, Liminge, Drelingore (Alkham), Addington near Maidstone, Petham

In Manning and Bray's "History and Antiquities of the County of Surrey," published in 1814, under the head of Merstham a statement appears to the following effect:

Manning and Bray's Surrey 1814.

"At considerable intervals of time a stream bursts out from the foot of Merstham hill, commonly called

the Bourne, and after a very short course falls into and swells the little stream* which has already been noticed. It generally succeeds wet unfavourable seasons, and lasts for some months. It is doubtless occasioned by the grand reservoir in some neighbouring hills being overcharged, the pressure from whence occasions an overflow in this branch of the syphon, and the efflux continues through the first convenient aperture until the proper level be restored."

Chauncy's Hertfordshire, 1826.

In Sir Henry Chauncy's "Historical Antiquities of Hertfordshire," published in 1826, reference is made to the Hertfordshire Bourne, in which he says:

"There is a small brook called Wenmer or Womer which sometimes breaks forth, and 'tis observed fore-runneth a dearth, or some extremity of dangerous import."

Brayley's Surrey, 1841.

In Brayley's "History of the County of Surrey," published in 1841, there is the following reference made to Bourne flows:

"In Surrey, outbursts of water from the chalk occur at the Bourne Mill near Farnham; near the church at Merstham; and at the spring near the church at Croydon. Occasional outbursts take place at the Bourne near Birchwood House; where during the spring of 1837 the water flowed in great abundance to Croydon, and continued six weeks. In the same year a rivulet burst forth in Gatton Park, between Merstham and Reigate.'

Brayley's Surrey, 1848.

In Brayley's "History of Surrey," edited and revised by Edward Walford, M.A., in 1848, reference is made to a Bourne near Lewes, Bourne Mill, Farnham, at the churches of Merstham and Croydon, and occasional burstings near Birchwood and Gatton Park.

Royal Agricultural Society's Journal.

In the *Journal* of the Royal Agricultural Society, vol. xv., there is a Paper by Mr. Clare Sewell Read

* A branch of the Mole.

upon "Farming in Oxfordshire," in which reference is made to a Bourne flow, where it is stated at page 193: "Some springs at the foot of the hills burst out in wet seasons and flow with great rapidity for months and are not seen again for years. The spring at Assenden, after having been dry since 1842, sent forth a very considerable stream during the chief part of last year" (1853). Assenden Bourne.

With reference to the cause of Bourne flows, it should be observed that these Bournes have always been involved in much mystery by some persons in the earlier periods of history, although it was clearly understood by some philosophers that their appearance, as mentioned by Childrey and others, was simply due to gluts of rain. All kinds of suggestions have been made with reference to the cause of the Croydon Bourne, namely, that it was due to some lakes of water in the distant downs, which are emptied in a mysterious manner by some peculiar syphon action, or that the Bourne communicated with a large store of water in the Godstone Quarries, which was discharged when these quarries had filled to a certain extent. Cause of Bourne flows. Volume of Water in Godstone Quarries.

On January 31st, 1877, the Author wrote a letter to the *Croydon Chronicle* with reference to the mythical allusion, which has been frequently referred to at different, times, with regard to the connection between the amount of water in the Godstone Stone Quarries and the flow of the Bourne at Croydon, wherein reference was made to the statement that when there was a volume of water varying from 11 million gallons to 15 million gallons stored in Godstone Quarries, the Bourne would commence to flow. In consequence of these statements, the Author had all the high-water marks which had been put up from year to year by an old man who worked in these quarries, of the name of Hill, levelled and reduced to Letter to *Croydon Chronicle*. 1877. Level of water in Godstone Quarries.

ordnance datum, when it became manifest that there were years when there has been a large quantity of water stored in the Godstone Quarries, and no appearance of the Bourne has taken place, as in the year 1849, when the height of the highest water in Godstone Quarries was 460·09 feet above ordnance datum, and no flow of the Bourne occurred, while in the year 1866, which is the largest flow of the Bourne that has been gauged, the highest water in Godstone Quarries was 462·31 feet above ordnance datum. In the year 1876, when the Bourne flowed, the water rose in Godstone Quarries to 443·12 feet above ordnance datum, whereas in the year 1854, when there was a very low water year in the country and there was no Bourne flow, the highest water in Godstone Quarries rose to 462·75 feet above ordnance datum, clearly showing that there is no direct connection between the volume of water in the Godstone Quarries, as has been repeatedly asserted, and the flow of Bourne. The highest water level in these quarries in the 1877 when the Bourne flowed, was 461·63 feet above ordnance datum ; in 1881 it was 458·58 above ordnance datum, and in 1883, 456·75 above ordnance datum.

Highest water level in Godstone Quarries.

The greatest height of water recorded in Godstone Quarries was in 1853, when it rose to 467·45 feet above ordnance datum, which was at the time of a large Bourne flow at Croydon. In the year 1866, the time of the largest flow of the Bourne that has been gauged, the water in these quarries rose to a height of 462·31 feet above ordnance datum.

Volume of water in Godstone Quarries indication of height water in ground.

It may be ordinarily taken that the volume of water in Godstone Quarries is an indication of the height of the water in the ground, and there are times when it may be used as an aid in judging of the likely appearance or not of a Bourne flow. It is possible also since

these quarries have been worked to a greater extent than in the earlier years that the water does not now rise so high in them as formerly was the case, and this circumstance must be taken into account, but at the same time their capacity for holding water has been increased.

Godstone Quarries ceased to be worked.

These quarries, which are located in the upper green sand formation, have ceased to be worked as quarries and are now devoted to the cultivation of mushrooms.

Bourne flows are peculiar to the chalk formation.

Bourne flows are peculiar to the chalk formation and are indicative of the large volume of water which at times is yielded by this formation. All Bourne flows are due to the large amount of rain that falls in the higher portions of the district raising the level of the ground water which flows down the valleys in a wave-like form.

Due to large amount of rain falling in higher portion of district.

Laws governing flow of underground water.

Underground water is subject to exactly the same laws and influences as water flowing over the ground, but is slower in its movements, and it has been observed in all river areas in which the streams are visible that flood waters descend from the highest to the lowest parts of the districts, that is, the floods are generated in the higher parts of the district, where there is the most rain and the least interference with it as regards diminution by evaporation and other causes. A Bourne flow is nothing more than a flood in the underground water passing down from the higher to the lower portions of the district swelling out of its ordinary underground channels over the surface by reason of the general elevation of the underground water line.

Bourne flow is a flood in the underground water.

In small Bournes at Croydon water disappears in the ground.

It has often been observed in connection with the Croydon Bourne flow that when the flow is small in passing down the valley the water enters the ground and disappears from sight, as the passages are there

large enough for its conveyance without appearing at the surface. The largest surface flow of the Bourne always occurs immediately below the "Rose and Crown" at Coulsdon, from which point down the valley it diminishes.

Croydon drainage area and how discharged.

The Croydon drainage area, which supplies the Bourne and the underground waters to the Croydon branch of the River Wandle, contains an area of 24 square miles. Of this area in ordinary times 14 square miles should discharge their waters from Purley Junction down the Brighton Road Valley directly into the head of the Wandle at Croydon, while 8 square miles drain unde the intervening high grounds and discharge into Waddon Mill Pond; the waters of the remaining 2 square miles have been diverted by the Oxted Railway Tunnel. In times of the Bourne flow a large proportion of the flow passes in the direction of Croydon and a lesser volume flows to Waddon; at all other times, unless interfered with by pumping, the yield of the respective areas is identical.

Author has kept records of water discharged from Oxted Tunnel since 1881.

The Author has kept continuous records of the waters discharged from the Oxted Tunnel since the year 1881, and he also knows exactly the quantity of water that has been discharged both from the Croydon area and the Waddon area for many years past, the records of which are kept up to date.

Investigations of amount of water yielded by chalk.

Rainfall Stations established.

In making an investigation of the amount of water that is yielded by the chalk formation on this particular Croydon area, the Author found it necessary to establish as many rainfall stations as could be secured, and wherever he could get observers he established a rainfall station, which were continued for a considerable period, and in this way more than twenty rainfall stations were established in the district and its imme-

diate neighbourhood, and have been maintained for a sufficient period until he was able to determine what was the law which governs the fall of rain in the various portions of the area surrounding Croydon. On the completion of the observations at the end of the year 1887 some of these rainfall stations have been continued, for wherever the observers were desirous of continuing the observations they were left in the possession of the rain-gauges, and the records from these gauges were taken over and have been published by this Society since 1887.

Difference in rainfall at top and bottom of drainage area.

As showing the enormous difference in the rainfall at the top and bottom of the drainage area of the Croydon branch of the River Wandle, it may be mentioned the gauge which the Author maintained at Botley Hill Old Toll Bar at the top of the drainage area at an elevation of a little over 870 feet above ordnance datum that in ten years, 1878 to 1887, the average rainfall at this station was found to be 34·68 inches per annum as against 24·68 inches the rain collected at Brimstone Barn at the bottom of the area at an elevation of 130 feet above ordnance datum.

Mr. H. S. Eaton's Investigations.

For the five years 1881-85 Mr. Henry Storks Eaton, M.A., F.R.Met.Soc., investigated the temperature and rainfall of Croydon and its neighbourhood, and prepared and presented a report for the Meteorological Committee of this Society. In these five years the average rainfall at Botley Hill was shown to be 31·94 inches, and at Brimstone Barn 23·25 inches. In Table IX. of the report then presented 21 rainfall stations are used; 15 of these stations were stations established by the Author for investigating the question of water supply in this neighbourhood.

When it is considered that the temperature in all the

higher parts of the district is considerably lower than at the lower parts of the same district, it follows that the amount of evaporation would be less in the higher districts, and therefore the quantity of rain percolating the ground would be proportionately greater in the higher districts. The Author succeeded in establishing a Meteorological Station under the care of the late Mr. W. Foster, of Henley, Chelsham, at an elevation of 610 feet above ordnance datum, which was kept going for 33 months in the years 1881, 1882, and 1883. In this time Mr. Eaton calculated the diminution of temperature in ascending the North Downs was one degree for every 231 feet of elevation.

Water in deep wells in higher district rise first.

Owing to the very much larger amount of rain which falls on the higher district, and its less liability to waste, it has been found that the water in the deep wells in the higher parts of the district always begins to rise before the water in the wells in the lower part of the district. This may appear rather curious to some persons that the top of the basin should begin to fill before the bottom, but when it is considered that a much larger amount of water percolates into the ground in the higher district, and that there is considerable resistance offered by the strata to the water flowing rapidly away from the upper part of the basin, it is sufficient to account for what really occurs which enables the Bourne flow to be predicted some considerable time before it breaks out.

Yield of strata constant under same conditions.

It may be taken as an absolutely ascertained fact that with the same height and fall of the water in the ground the quantity of water yielded by a particular area will always be the same, and knowing the height to which it is necessary for the water to rise before a Bourne will make its appearance, this height may pro-

bably be determined some two or three weeks earlier by the rise of the water in a well in the upper portion of the district to what it would be at a point near where the Bourne usually breaks out. Consequently with a continuity of observations, and knowing the level of the waters of the upper wells, there is no reason why any person in any district should not be able to predict with absolute certainty as well as the Author has done from year to year, the exact time when a Bourne will occur, and its probable volume when it breaks out. The period of high water in a well at Cambrian House, Caterham, has been ascertained to be from twenty to forty-five days before the time of high water in a well at the "Rose and Crown," Coulsdon, lower down the valley, and located close to the place where the Croydon Bourne first breaks out. The Author also ascertained that when the water in the well at Cambrian House well rose to a level of 340 feet above ordnance datum there would be a small Bourne flow in Caterham Valley, and when the water in this well rose to 370 feet above Ordnance datum, then the flow would increase and extend up the valley and there would be a flow in Marden Park.

Prediction of Bourne flows.

Cambrian House well.

"Rose and Crown" well.

Level of water to produce Bourne flow.

The owner of Cambrian House well objected after a time to his well being measured, and covered it over, and would not suffer any provision to be made for its future measurement.

The following table gives the years when it has been reported that the Croydon Bourne has flowed, and gives the name of the person on whose authority the statement is made:

Table of Croydon Bourne flow.

Table of Croydon Bourne Flows.

Year.		On the authority of
1472.*	Mentioned by John Warkworth, D.D.	
1660.	Mentioned in Aubrey's "Surrey."	
1665.	,,	,,
1668.	,,	,,
1818.	Copious . . .	Mr. C. W. Johnson.
1821.	Copious . . .	,,
1824.	Very Copious . .	,,
1829.	Moderate . .	,,
1836.	Moderate . .	,,
1837.	Abundant . .	Mr. E. W. Brayley.
1840.	Moderate . .	Mr. C. W. Johnson.
1841-2.	Copious . . .	,,
1852-3.	Copious . . .	,,
1860-1.	Moderate . .	Mr. James Fenton.
1863.	Small . . .	C. W. Johnson, F.R.S.
1866.	Very large . .	Mr. Baldwin Latham.
1873.	Moderate . .	Mr. Thomas Walker.
1876.	Moderate . .	Mr. Baldwin Latham.
1877.	Very large . .	,,
1878.	Small . . .	,,
1879.	Moderate, but flowed for long period .	,,
1880-1.	Copious . . .	,,
1882.	Moderate . .	,,
1883.	Copious . . .	,,
1887.	Moderate . .	,,
1889.	Small . . .	,,
1891-2.	Moderate . .	,,
1893.	Moderate . .	,,
1895.	Just rose to surface	,,
1897.	Moderate . .	,,
1903-4.	Very large . .	,,

* This would be 1473 new style.

It is by no means certain, however, that the Croydon Bourne has not flowed very many times and has not been recorded, especially in the earlier periods, and it will be noted that in making a collection of the dates when Bournes have flowed out of Orpington Gravel pits, the dates of which were supplied to the Author some years ago by Dr. Alfrey, of St. Mary's Cray, when there has been a Bourne flow out of the Orpington Gravel pits there has usually been a Bourne flow at Croydon. The following figures give the dates when a Bourne has flowed out of these Orpington gravel pits, and in all probability the Bourne flowed at Croydon in the same years.

Orpington Bourne flow.

Year			
	1795	1817	1866
	1799	1825	1873
	1809	1828	1877
	1811	1841	1904
	1812	—	—

Wickham Valley Bourne.

According to the Author's observations a flow of the Bourne occurred in the Wickham Valley in the years 1877, 1879, 1881, and 1883, and it has not flowed since the latter year, as large quantities of water are now taken from this valley for the supply of water to London and Croydon. The flow of the Bourne in this valley is usually later than in the Caterham Valley. In the Bourne flow of 1880-81 the Bourne broke out in the Caterham Valley on the 12th December, 1880, but it was not until the 8th February, 1881, that it broke out in the Wickham Valley. There has also always been a flow of the Bourne in the Brighton Road Valley at Smitham Bottom every time there has been a moderate or large flow of the Bourne in the Caterham Valley.

Smitham Bottom or Marlpit Lane Bourne.

Influence of rain on Bourne flows.

It should be observed that with regard to the influence of rain on a Bourne flow, that it is the rain that falls immediately preceding a Bourne flow which really governs its future appearance and volume. This is very clearly seen from the fact that so great an authority on Bourne flows as the late Mr. Cuthbert Johnson, who stated clearly that there could be no Bourne flow in 1877, having regard to the fact that there had not been 30 inches of rain at Croydon in the preceding year, and that it was only when 30 inches of rain fell during the preceding year that a Bourne flow at Croydon occurred. If, however, rain is tabulated over the six months from October in one year to March in the following year, it will be seen that it corresponds with the volumes of the Bournes which have occurred.

The following figures give the rainfall at Croydon between October and March for all the years of Bourne flows between 1865 and 1904.

Table showing the Distribution of Winter Rainfall at Croydon in Periods when a Bourne Flow has occurred.

	1865-6. Inches.	1872-3. Inches.	1876-7. Inches.	1877-8. Inches.	1878-9. Inches.	1879-80. Inches.	1880-1. Inches.	1882-3. Inches.	1886-7. Inches.	1888-9. Inches.	1891-2. Inches.	1892-3. Inches.	1894-5. Inches.	1896-7. Inches.	1903-4. Inches.
October . .	7·19	5·24	1·31	2·22	2·18	·69	7·50	5·70	2·29	1·39	6·01	4·23	5·25	3·34	5·28
November .	2·86	3·50	2·67	5·21	3·89	·20	2·33	2·23	3·34	3·89	2·62	2·42	4·30	1·52	2·37
December .	1·48	4·39	7·43	1·87	1·51	·93	3·06	2·09	4·41	1·48	3·53	1·31	1·71	3·29	2·16
January . .	4·51	4·08	5·53	1·18	2·60	·41	1·13	2·07	1·72	1·14	·56	1·80	1·76	1·77	3·63
February . .	5·11	1·69	1·70	1·49	3·45	2·75	3·05	4·42	·48	2·26	1·66	3·33	·29	2·04	3·05
March . .	2·08	1·55	2·15	1·34	·53	·64	1·55	1·01	1·86	2·14	1·57	·52	1·49	3·96	1·52
	23·23	20·45	20·79	13·31	14·16	6 62	18·62	17·52	14·10	12·30	15·95	13·61	14·80	15·92	18·01
Year preceding	30·79	35·27	27·16	34·16	29·98	30·89	30·57	26·49	26·96	27·74	30·55	25·14	31·41	26·04	38·74

In 1880 there was no Bourne flow at the ordinary period. The flow in this year commenced at the end of the year and continued into 1881.

In September, 1896, there were 7 inches of rainfall in the month.

Fallacy of seven years recurrence of Bourne flow.

We constantly hear that the Croydon Bourne flows every seven years. This is, however, not so, as there is no stated interval for its appearance, and in fact between 1876 and 1883 it flowed every year for eight years in succession.

Coldness of water of Bourne flows.

There are some peculiarities concerning the Bourne flow which have been noted by old observers, one of these being the coldness of the Bourne water compared with ordinary spring water of the chalk. In the Bourne that flowed in 1860-61, of which there is a record in Warren's "Croydon Directory" for the year 1865-66, and in the late Mr. Cuthbert Johnson's paper on the Croydon Bourne flow in Dr. Westall's paper on the advantages to be derived from the adoption of the Local Government Act as exemplified in Croydon, published in 1865, the temperatures of this Bourne are given, showing that it possessed a low temperature when flowing in its natural channel, as compared with its temperature even when it escapes from the mouth of the Bourne culvert at Croydon.

Temperature of Bourne due to temperature of ground.

The Author has taken a large number of temperatures of the Bourne, which confirm the fact that the Bourne flow is a cold water, but this is due entirely to the circumstance that the chalk water is brought up to or near the surface of the ground when the Bourne flows, and

Cold season influences temperature of Bourne.

that the Bourne ordinarily flows in a cold season of the year when the temperature of the ground at or near the surface is cold, and thus the temperature of the Bourne conforms to the temperature of the ground at the depth at which it is flowing.

Bourne water not good for irrigation.

In the *Journal* of the Royal Agricultural Society, vol. 15, page 416, there is a statement as to the use of Winterburn waters for irrigation, the quality of

which is not held to be so good as that from permanent sources. This no doubt is due to its coldness as compared with permanent springs.

Temperatures and analyses of Bourne flows.

In the year 1881, and at other times, the Author, in conjunction with Messrs. Wigner and Harland, made a prolonged series of investigations both as to the temperature and the analysis of the waters of the Bourne flow and the waters of the wells of the district. The following Table gives the result of one of these investigations, beginning with the waters flowing south from Oxted Tunnel out of the North Downs, the waters in Godstone Stone Quarries, and the waters in the Caterham Valley, down to the mouth of the Bourne Culvert at Croydon. In the whole twenty-one temperatures and separate analyses of the water were taken when the Bourne was flowing on the 3rd February, 1881.

(See next page for Table.)

Table of Temperatures and Analyses of Waters at the Time of a Bourne Flow on 3rd February, 1881. Analyses by Messrs. Wigner and Harland.

	Temperature of Sample when taken ° Fahr.	Grains per Gallon.							Hardness.	
		Total Solids.	Oxygen absorbed in 3 hours at 60°.	Loss on Ignition	Chloride of Sodium.	Nitrogen as Nitrates.	Ammonia.	Albuminoid of Ammonia.	Before Boiling.	After Boiling.
Oxted Tunnel	50·5	30·40	·0272	3·80	2·10	·3150	·0017	·0020	14·7	3·4
Godstone Quarries	45·4	18·00	·0272	4·20	2·12	·2450	·0032	·0015	10·7	2·5
Cambrian House Well	49·5	24·60	none	1·60	2·34	·4970	·0012	·0013	18·8	3·0
Marden Lodge Well	48·2	30·00	·0158	2·80	2·34	·2800	·0022	·0024	18·3	2·5
Bughill Farm Well	49·6	30·80	·0130	3·80	4·33	·7000	·0017	·0019	22·0	3·4
Well Farm Well	48·2	19·00	·0070	1·00	2·34	·3500	·0016	·0024	15·4	2·7
Bourne Flow, Wapses Lodge	41·6	26·40	·0330	3·80	1·87	·3600	·0021	·0014	17·0	3·0
Bourne Flow, opposite Rose Cottage	45·5	31·40	·0286	5·80	4·93	·4900	·0026	·0053	21·0	3·0
"Rose and Crown" Well	48·8	23·80	·0014	3·20	1·87	·3500	·0018	·0019	15·4	2·0
Bourne Flow, Garston House	44·8	24·60	·0040	6·00	2·12	·3500	·0024	·0022	19·6	2·5
Well, Kenley Waterworks	50·2	21·80	·0014	3·60	1·80	·3500	·0044	·0018	16·0	2·6
Bourne Flow, Great Roke Farm	43·5	24·00	·0158	3·40	1·99	·3500	·0019	·0027	18·0	3·2
Bourne Flow, Caterham Junction	43·8	24·20	·0186	6·00	2·15	·3500	·0010	·0014	17·4	3·2
Tudor Cottage Well	47·5	33·00	·0400	5·00	3·39	1·1200	0013	·0025	22·5	4·7
New Sewer, Brighton and Godstone Roads*	43·8	24·40	·0100	3·60	2·46	·3500	·0026	·0056	20·4	3·3
Hayling Lime Works Well	50·0	23·00	·0070	3·60	2·12	·3500	·0014	·0007	16·6	2·3
Water in new Sewer, "Windsor Castle," Brighton Road *	45·0	26·00	·0086	4·00	2·34	·6300	·0037	·0018	21·0	2·7
Croydon Waterworks Old Well	51·0	22·00	none	3·40	2·34	·2800	·0018	·0019	17·2	3·3
Experimental Well, Croydon	50·75	20·80	·0070	3·20	2·22	·3360	·0013	·0017	14·0	2·7
Mouth of Bourne Culvert, Croydon	49·5	22·00	none	3·80	2·12	·3500	·0013	·0008	17·5	2·7
Mouth of New Culvert, Croydon	51·0	22·40	·0040	3·40	2·34	·3300	·0039	·0013	14·0	2·5

Mean temperature on the 3rd February, 1881, at the Author's house at Croydon, was 46·1 degrees.

* This was a new sewer that had recently been constructed by the Croydon authorities and admitted a considerable volume of Bourne water.

Temperature of the ground.

The following figures show the temperature of the ground on the 3rd February, 1881, as taken at the Author's house at Croydon: *

Max. 6 ins.	Min. 6 ins.	2·5 feet.	5 feet.	10 feet.	15 feet.	20 feet.
°	°	°	°	°	°	°
41·0	29·0	38·2	39·5	45·1	47·7	49·9

25 feet.	30 feet.	35 feet.	40 feet.	45 feet.	50 feet.
°	°	°	°	°	°
50·3	50·5	50·3	50·10	50·0	50·10

With reference to the first two temperatures, six inches maximum and six inches minimum, these are registered temperatures and give the highest and lowest temperatures recorded; the other temperatures are daily temperatures taken at 9 A.M. in the day. It will therefore be seen, by comparing the temperatures above ten feet with the temperature of the Bourne where it flows above the surface, that the ground temperature will account for the particularly low temperatures observed in these Bourne flows as compared with the temperatures of the water flowing from Oxted Tunnel and in the wells of the Kenley and Croydon Waterworks.

Bourne flows influenced by barometric pressure.

Another peculiarity has been observed in the Bourne, to which the Author, in 1881, directed attention in a paper read to the British Association at York, entitled "Influence of Barometric Pressure on the Discharge of Water from Springs," where it is pointed out that:

* Mean temperature of the air for the year 1880 at the Author's house at Croydon 49·84° Fahrenheit.

Wind influencing Bourne flows.

"The country people in Surrey have a saying that when the Croydon Bourne flow is expected in the Caterham Valley a south-west wind or gale favours its appearance, while an easterly wind drives it back. Of course a south-westerly wind usually brings rain, and an easterly wind is a dry wind producing the contrary effect. This explanation will probably account for the Bourne flow and its diminution, but there are also other conditions in connection with these winds that should receive attention and which would influence the flow of the Bourne."

Conditions under which water exists in the ground.

Upon investigating the subject the Author found that the flow of the Bourne was particularly subject to variation in flow under atmospheric pressure, and in his paper in 1881 gave the following explanation with reference to this matter. "It may be assumed in reference to underground water that there are three zones in the earth which affect the question of supply, the first of which is comprised in that area measured from the surface of the ground downwards which is subject to periodical wetting and partial drying. The depth of this zone varies no doubt every year, depending upon the amount of rain which percolates and the evaporation subsequently taking place. Then there is a second zone in districts like the chalk formation, in which the water level is removed a considerable distance from the surface, which is always charged with water by capillarity, and from which the water percolating from the upper zone passes on its way to the third or lower zone, which is occupied not only by water held by capillarity of the strata but by water which moves freely through the strata itself. This third or lower zone is the one which furnishes every year the supplies of water which are yielded by the

springs, and the yield of the springs in any one year depends upon the amount of water stored in this zone. In cases where the wells are shallow the middle zone is absent. When replenishment of the springs takes place, it is not the immediate rain that passes into the lower zone, but a given volume of rain percolating drives out an equal quantity of water held by capillarity in the earth, and so rain is held in the earth in some cases for many years before it flows out again as springs, but the flow in any one year is dependent upon the amount of rain previously percolating in that particular season. The mineral constituents of water that has been held so long in the ground vary but slightly from year to year regardless of the volume flowing.

Ground water and strata contain air.

" Water held in the ground contains air and gases and the rocks also contain them. This being so, a reduction in barometric pressure has a tendency to cause this air or gas to escape from or expand in the water, or at other times for the water to retain under high barometric pressure a larger amount or to compress the air or gas present. The effect, therefore, of a fall of the barometer is to aid in the escape of water by reason of the expansion of the gases under low barometric pressure. On the other hand, under high barometric pressure the condensation of the gases leads to the retardation of the flow and the escape of the water.

Observations on Croydon Bourne.

" In order to determine whether or not the actual flow of water from the ground was affected by barometric pressure, the Author commenced a series of observations upon the Bourne flow in the Caterham Valley in the present year (1881). For this purpose he had a gauge dam constructed across the stream, and the quantity of water flowing over was recorded by a

self-recording machine. Neglecting periods when there was rain, it was quite clear from the observations that whenever there was a rapid fall of the barometer there was an increase of the quantity of water flowing, while a rapid rise in the barometer caused a diminution in the volume flowing, as the following examples will show.

"1st. The barometer commenced to fall on the 24th February, 1881, and fell until the 28th. The Bourne flow during this time increased from 357·6 cube feet per minute on the 24th to 387·4 cube feet per minute on the 26th. The barometer began to rise on the 28th February, and rose until the 2nd March, and then commenced to fall. The Bourne flow diminished from 379·0 cube feet per minute on the 28th February to 345·3 cube feet per minute on the 1st March There was a very marked depression in the Bourne flow during the period of the rise of the barometer. The prevailing winds during the period of these observations were easterly.

"2nd. On the 11th March, 1881, the barometer commenced to fall, and fell until the 14th, when it commenced to rise. The Bourne flow increased from 511·4 cube feet per minute on the 11th March to 568·2 cube feet per minute on the 14th March. With the rise of the barometer the flow diminished. From the 15th to the 17th during all the period the barometer was rising there was a marked diminution in the Bourne flow. The wind during the period of these observations was north-west and south-east.

"3rd. The barometer began to fall on the 27th

March and fell to the 29th, when it commenced to rise. The Bourne flow increased from 534·8 cube feet per minute on the 27th to 549·1 cube feet per minute on the 29th, and it fell to 502·2 cube feet per minute on the 30th March.

"4th. The barometer fell from the 31st March to the 1st April. The Bourne flow increased from 502·2 cube feet per minute on the 30th March to 525·5 cube feet per minute on the 1st April, and with the rise of the barometer on the 1st April it fell, so that on the 3rd April the flow was but 456·7 cube feet per minute.

"5th. The barometer commenced to fall on the 4th April and fell to the 5th. On the 6th it commenced to rise and remained moderately high until the 10th April. The Bourne flow rose from 456·7 cube feet per minute on the 3rd April to 479·3 cube feet per minute on the 5th April, and fell to 399·8 cube feet per minute on the 10th instant.

"It should be observed that after the 24th March there was a decline in the Bourne flow, which had reached its highest discharge on that day."

Rise and fall of water in deep wells.

The Author also gave further information with reference to the rise and fall of the water in deep wells, showing that whenever there was a fall in the barometer there was a corresponding rise in the water line of the well and *vice versa*; with a rise of the barometer there was a decline in the level of the water in the well, and this was shown in a most marked manner by experiments which were carried out at the boring made for the Croydon Rural District Council at their sewage works at Merton. These results have

Blowing wells at Northallerton.

also since been confirmed by the experiments which have been made at the blowing wells at Northallerton, from which with a falling barometer there is a distinct outflow of air from the well, while with a rise of the barometer there was a distinct inflow of air into the well.

Journal Royal Agricultural Society.

In the fifteenth volume of the *Journal* of the Royal Agricultural Society, page 416, there is a paper on "Farming in Dorsetshire," by Mr. Louis H. Ruegg, which contains a quotation from Mr. John Baveystock Knight, of West Lodge, Piddleton, where it is stated that: "A curious fact in relation to the annual bursting of these springs (winter Bournes) is, that their breaking as it is termed is always accompanied with strong gales of wind generally from the south-west with rain, but without a strong gale they never break however wet the season."

Gales necessary for breaking of Bourne flows.

Experience of present Bourne.

It should be observed that the present Bourne at Croydon rose last November when the barometer was rising and the wind was W. and W.N.W., so that it is not essential that in order to produce a Bourne flow there should be a falling barometer or that the wind should be S.W.

Braithwaite's paper on River Wandle.

In January and February, 1861, a paper by Frederick Braithwaite, M.Inst.C.E., on the River Wandle, was read and discussed at the Institution of Civil Engineers, being the result of a survey "made early in the spring of the year 1853." It is also stated in the paper that "when the springs at Marden Park have flowed about thirty days in the direction of Croydon they commenced flowing in the direction of West Wickham in Kent," and that there is "evidence that the Bourne ran during two entire years, in 1841 and 1842 a period of great rain."

At the time this paper was read a Bourne was flowing at Croydon.

Much importance was attached to the flow of the Bourne in 1852-3, as to its influence was ascribed the great outbreak of fever that occurred at Croydon at the time of the appearance of the Bourne, and continued while the Bourne lasted.

1852-3. Outbreak of fever attributed to Bourne flow.

In the paper and the discussion that followed it, we have for the first time recorded the volume of water flowing at the time of the Croydon Bourne flow. It is stated that the volume flowing in the spring of 1853 before arriving at the Croydon and Epsom Railway was more than 19 million gallons per day, or 2111·1 cube feet per minute. Two gaugings are given of what is called the Bourne Brook, one of 17,625,600 and the other 16,158,780 gallons per day, or 1,958·4 and 1,795·42 cube feet per minute respectively. The flow of the Bourne that rose 1860-1 is referred to, and Mr. Hawksley stated that the flow of the River Wandle was now 20 million gallons per day or 2222·2 cube feet per minute, and Mr. Fenton, the Surveyor of Croydon, stated that the flow under Riddlesdown of this Bourne was at the rate of 1,500 gallons (240 cube feet) per minute, and the flow out of the Bourne culvert at Croydon was 3,500 gallons (or 560 cube feet) per minute. It was also stated by Mr. Hawksley during the discussion on the paper that the sewers of Croydon at this time carried away nearly 2 million gallons per day of spring water (222·2 cube feet per minute).

First record of volume of water flowing.

Gaugings of Bourne Brook.

Flow of Wandle in 1860-61.

Flow of the Bourne 1861.

Leakage into Croydon sewers 1861.

It is also recorded in the Minutes of the Croydon Local Board that the Bourne of 1860-61 was flowing on the 31st of December, 1860, at a point two miles from the town, and that it rose under Riddlesdown in November, 1860.

Date of Bourne flow 1860-61.

The Author's first personal acquaintance with the Croydon Bourne flow was that which occurred in the year

Author's first acquaintance with Croydon Bourne.

1866, when the matter was prominently brought to his attention by reason of a set of plans having been submitted to him for approval (as Surveyor for the Croydon Local Authority) just before the Bourne appeared for the building of the public-house which is now known as the "Royal Oak" in the Brighton Road, the building of which would have completely blocked up the channels of the Bourne, and to which the Author objected, and he was then informed that the Bourne was not likely to flow again, as some works had been constructed in the hills, evidently alluding to the construction of the railway and the adit driven in advance of the Oxted Tunnel; but while the matter was under consideration the Bourne broke out to the surprise of all parties, and as a consequence provision was made for continuing the Bourne channel past the site of the house in question.

Construction of Oxted Tunnel as affecting volume of Bourne flow.

It will not be out of place at this juncture to refer to the construction of the Oxted Tunnel as affecting the volume of the Croydon Bourne flow.

It is not generally known that some years ago, before the present Oxted Tunnel was made, that there was a proposal to make a tunnel through the hills at a low level, 2½ miles long, at Oxted, in connection with the original railway to Dover, but its construction was opposed by the landed proprietors on the chalk range by reason of the likelihood of its drawing off the water. Ultimately an agreement was made with the landed proprietors that they were to be compensated if the water was lost and the Bill passed. This tunnel was to be constructed not only through the chalk, but cut the gault as the present tunnel does. The matter was referred to Sir W. Cubitt, the engineer, who on investigation found that if the tunnel was made, the springs

would be tapped, and compensation would have to be paid, and he recommended the Company to have another line surveyed, and the present South Eastern Line through Merstham Tunnel was the result, this tunnel being adopted both by the Brighton and South Eastern Railways.

Present Oxted Tunnel.

The present Oxted Railway Tunnel was carried out without opposition from any of the landed proprietors, who dreaded being damaged by means of the diversion of the underground waters from their estates, or even by any of the riparian owners on the Wandle, although considerable injury has been inflicted on the River Wandle proprietors by reason of the diversion of a portion of the waters from their watershed.

Considerable injury to River Wandle.

Marlpit Lane Bourne.

We may now refer to what the Author has called the Marlpit Lane Bourne, Brighton Road, which has this year again flooded the lands at Red Lion Green, Smitham Bottom, and there disappears into the ground.

Merstham Tunnel.

The present origin of this Bourne is due to the construction of a culvert which conveys the water from Merstham Tunnel when the springs are high. It is recorded that when sinking the shafts in connection with the Merstham Tunnel, water was met with, which obliged the contractors to drive an adit through the gault below the bed of the tunnel to tap the springs, and that when this was done the springs in the neighbourhood were drained. The Merstham Mill Head was dry for some years till the tunnel was finished. Afterwards the water from the adit from the tunnel was turned into the Old Mill Head, and now the mill works again not from the original springs but from the tunnel.

Clayton Tunnel.

It appears also that in the construction of the Clayton Tunnel on the Brighton Line an adit was driven and a large quantity of water was liberated in a similar manner.

Flow from Oxted Tunnel gauged.

The Author has had the quantity of water flowing out of the Oxted Tunnel regularly gauged during the last 24 years, and has found the largest quantity that during that period has flowed away was during the present year, when on the 19th February 326·03 cubic feet per minute flowed away from the Croydon area. The previous largest quantity was 248·8 cubic feet per minute on 20th February, 1883. The quantity of water flowing from the Oxted Tunnel does diminish the volume of the Croydon Bourne, and may prevent some small flows from taking place.

Gaugings of 1866 Bourne.

This 1866 Bourne flow was gauged by the Author on many occasions for the information of Croydon Authorities, and especially their Chairman, the late Mr. C. W. Johnson, F.R.S., who took great interest in such matters. When this Bourne was at its highest point of flow, on the 27th February, 1866, the quantity flowing into the Bourne culvert at the "Windsor Castle," Brighton Road, which was then the upper end of the culvert which had been constructed for the diversion and the prevention of flooding by the Bourne of the lower parts of Croydon, and for lowering the level of the water line under the Old Town of Croydon, was at the rate of 1,800 cubic feet per minute, and the volume flowing out of the mouth of the Bourne culvert into the Wandle on the same day was 3,212 cubic feet per minute, this being the largest flow of the Bourne of which there is any record.

Gaugings of 1873 Bourne.

In the year 1873 there was another Bourne flow at Croydon, and the volume of this flow was gauged by Mr. Thomas Walker, the town surveyor of Croydon, and the quantity of water flowing into the Bourne culvert at the "Windsor Castle," on the 17th February, 1873, was 228 cubic feet per minute, and out of the

Bourne culvert 1,089 feet per minute. On the 2nd March of the same year the quantity flowing into the Bourne culvert was 129 cubic feet per minute, and the flowing out 1,105 cubic feet per minute. On the 1st April, 1873, there was no water flowing into the Bourne culvert, but there was 864 cubic feet per minute flowing out of it.

Hydro-Geological Survey of Croydon.

In the beginning of the year 1876, the Author commenced a hydro-geological survey of Croydon and its neighbourhood, which he has continued from that time up to the present date.

Bourne flowing in 1876.

In the year 1876 he discovered that there was a Bourne flowing in the Caterham Valley below the "Rose and Crown," but at the time it was declining in flow, and on the 8th of May it was flowing below the "Rose and Crown" at the rate of 73·63 cubic feet per minute.

Gaugings of 1876 Bourne.

On the 4th of May of that year, the quantity observed to be flowing out of the Bourne culvert at Croydon was 478·7 cubic feet per minute. In consequence of the observations carried on in this year to trace the cause of the Bourne flows, the Author found previous to the next year the conditions had arisen necessary to produce a flow of the Bourne, and as a consequence he made an application to the Croydon Local Authorities for permission to line the Bourne channels in order to gauge the Bourne which was coming out, when owing to the discussion which took place on that occasion, it was stated by the Chairman of the Board, the late Mr. C. W. Johnson, F.R.S., that there could be no Bourne flow in Croydon, as there never was a Bourne flow unless there had been 30 inches of rain in the previous year. This discussion and the assertions then made induced the Author to make some careful calculations, and the consequence was that he wrote a letter to the *Croydon Chronicle* on the 11th of January, 1877,

Discussion of Croydon Local Board, 1876.

Author predicted Bourne.

predicting that a Bourne flow would take place immediately below the "Rose and Crown," which would be followed by it breaking out in Marden Park. This Bourne proved to be a large Bourne flow; the flow commenced on the 18th of January, 1877, and on the 14th of February the quantity flowing below the "Rose and Crown" at Coulsdon was 1,745·7 cubic feet per minute, and of the Bourne culvert at Croydon it was 2,120 cubic feet per minute.

Gaugings of 1887 Bourne.

From the year 1877 up to the present time the Author has predicted with perfect accuracy both the volume and date on which all the subsequent Bourne flows have made their appearance in the Caterham Valley. In the whole he has accurately predicted, between 1877 and 1903-4, thirteen Bourne flows, and there have been no Bourne flows or anything approaching a Bourne flow in any of the intermediate years when no Bourne flow has been predicted.

Bourne of 1877 a recurring Bourne.

The peculiarity of the 1877 Bourne was that it was a recurring Bourne, that is, it rose to a high point and then fell and rose again, and subsequently declined. The gaugings of this Bourne flow are shown graphically in Plate No. 2. It should be observed with reference to the rise and fall in the Bourne flow that the water in the wells removed some distance from the Bourne flow show a corresponding rise and fall in their water line with the flow of the Bourne, but the wells near the Bourne channel which are near to the flowing stream of the Bourne, and all wells below the level at which the Bourne breaks out, show no fluctuation in flow, as the overflow by the Bourne prevents the water rising in the ground to a higher point than the natural overflow into the Bourne channel.

Bourne of 1878.

In 1878 a very small Bourne appeared; the Bourne

rising on the 30th April reached its highest flow on the 23rd May, when it was 24·49 cubic feet per minute below the "Rose and Crown" at Coulsdon, and ceased to flow on the 18th June. The flow out of the Bourne culvert at Croydon on the 23rd May was 341·3 cubic feet per minute. This Bourne only flowed a short distance down the Caterham Valley and disappeared into the ground.

Bourne of 1879.

The year 1879 was a wet and cold year, very disastrous to agricultural interests. A Bourne rose in the Bourne channel below the "Rose and Crown" at Coulsdon on the 16th February, and commenced to flow on the 17th, and on the 18th was flowing at the rate of 3·16 cubic feet per minute, which increased to 119·44 cubic feet per minute on the 2nd April, after which it fell and rose again to 170·62 cubic feet per minute on the 25th August; it again fell, and rose to 222·12 cubic feet per minute on the 25th September, and ceased to flow on the 18th December. The largest quantity of water flowing out of the Bourne culvert at Croydon was 420·4 cubic feet per minute on the 9th April.

Bourne of 1880

In the year 1880 there was no flow of the Bourne at the usual period when the Bourne flow ordinarily takes place in the spring of the year, but the Bourne rose below the "Rose and Crown," Coulsdon, on the 12th December, or very nearly at the same period of year on which in the preceding year it ceased to flow. On the 15th December it was flowing at the rate of 5 46 cubic feet per minute. It reached its maximum flow below the "Rose and Crown," Coulsdon on the 24th March, 1881, when it was flowing at the rate of 642 cubic feet per minute, and disappeared on the 25th June, 1881, the last gauging on the 22nd June

Gaugings 1880 Bourne

being 1·18 cubic feet per minute. On the 25th December, 1880, the flow out of the Bourne culvert at Croydon was 202·1 cubic feet per minute, and on the 24th March, 1881, it was 515·2 cubic feet per minute.

Flow out of Bourne culvert less than Bourne flow.

It will be observed that in this year for the first time the quantity of water flowing out of the Bourne culvert at Croydon at the maximum period of flow was considerably less than the surface flow in the Caterham Valley below the "Rose and Crown" at Coulsdon, and

Leakage into Sewers.

in this year there was a considerable volume of water which found its way into the new sewers in Brighton Road which had lately been constructed by the Croydon authorities.

Bourne of 1882.

In 1882 the Bourne rose on the 12th of January below the "Rose and Crown," Coulsdon, and on the 16th January it was flowing at the rate of 3·34 cubic feet per minute, and increased to 113·8 cubic feet per minute on the 28th c. February, and ceased to flow on the 4th May. The largest flow out of the Bourne culvert was on the 3rd March, when it was 142·9 cubic feet per minute.

Bourne of 1883.

In 1883 the Bourne rose on the 12th of January in the Bourne channel below the "Rose and Crown" at Coulsdon, and on the 14th January it was flowing at the rate of 5·1 cubic feet per minute. On the 7th March it was at its maximum and flowing at the rate of 738·4 cubic feet per minute, and it ceased to flow on the 11th of June of that year. On the 7th March the volume flowing from the Bourne culvert at Croydon was 579·0 cubic feet per minute.

Bourne of 1887.

The next Bourne occurred in the year 1887, when it rose in the Bourne channel below the "Rose and Crown" at Coulsdon, and on the 17th of February it was flowing at the rate of 39 cubic feet per minute.

On the 12th of March at the same place, the flow was 57·48 cubic feet per minute, and on the 16th April it ceased to flow. The largest quantity flowing out of the Bourne culvert at Croydon was on the 27th March, when it was 69·45 cubic feet per minute.

The flow of this Bourne did not extend down the valley more than about half a mile below Kenley railway station where it disappeared into the ground.

After this year the Author did not give so much attention to flows of the Bourne except the prediction of the times of their appearance.

Bourne of 1889.

In 1889 there was a small flow of the Bourne in April of which no particular observations were made.

Bourne of 1891-2.

In 1891 and 1892 a moderate flow of the Bourne occurred. The Bourne broke out on the 10th December, 1891, and it was reported by the Borough Engineer of Croydon that on the 23rd January, 1892, the flow on the surface had reached to within a few yards of the east side of the main line of railway at Purley. Shortly afterwards it decreased, and the flow on the surface had receded to Foxley Hatch House, a distance of about 350 yards.

Bourne of 1893.

In 1893 another Bourne broke out in the Caterham Valley. This was only a flow of a moderate extent. On the 8th April it was flowing at the rate of 180 cubic feet per minute below the "Rose and Crown." It only flowed down the Valley as far as Little Roke Farm, and there disappeared into the ground.

Bourne of 1895.

In 1895 another Bourne made its appearance in the Bourne Channel below the "Rose and Crown," but it only just appeared on the surface and lay in the bottom of the channel, and then went back without actually flowing.

Bourne of 1897

In 1897 a further Bourne broke out below the "Rose

and Crown," Coulsdon. This Bourne was reported to the Corporation of Croydon on the 12th April, 1897, by reason of the Bourne channels having been filled up, and the necessity of opening them out or making new channels should the flow of the Bourne continue, which fortunately it did not. This was the last flow of the Bourne previous to the flow that is now taking place.

Bourne of 1903-4

The Bourne of 1903-4 broke out below the "Rose and Crown," Coulsdon, on the 22nd November, 1903. The flow was 2·85 cubic feet per minute on the 23rd November. It increased to 284·36 cubic feet per minute on the 5th January last, after which it diminished to 201·81 cubic feet per minute on the 26th January, after which it rapidly increased, and on the 23rd February it was flowing at the rate of 1,494 cubic feet per minute, from which time it has gradually subsided, and on the 10th May, 1904, it was flowing at the rate of 81·27 cubic feet per minute. The largest flow out of the Bourne culvert at Croydon occurred on the 20th February last, when 911·63 cubic feet per minute flowed out, and on the 23rd February the flow was 866·66 cubic feet per minute—a very much smaller quantity than was actually flowing at the "Rose and Crown," Coulsdon—a most unusual thing, showing that the water of the Bourne had been lost and diverted to other channels than those which were originally designed for its reception.

Flow out of Bourne culvert less than volume of Bourne at "Rose and Crown."

Water lost from Bourne.

In 1877 flow out of Bourne culvert more than Bourne at "Rose and Crown."

With present Bourne, flow out of Bourne culvert not more than half of Bourne flow below "Rose and Crown."

It will be noted that on the 14th February, 1877, 2,120 cubic feet per minute flowed out of the Bourne culvert, the quantity flowing at that date at the "Rose and Crown" being 1,745·7 cubic feet per minute. With the present Bourne matters are reversed, and the flow out of the Bourne Culvert at Croydon is not more than one-half of the flow below the "Rose and Crown"

at Coulsdon, and even if the flow of water out of the new culvert which was made a few years ago is added, the total flow into the head of the Wandle at Croydon on the 23rd February of this year was but 1,029·94 cubic feet per minute, a considerably less quantity than was flowing at Coulsdon.

No doubt Bourne waters have gone into Croydon sewers.

There can be no doubt that the waters of the Bourne have been transferred from the ordinary channels of the Bourne into the Croydon sewers, as it will be noted that since the year 1880, the volume of water flowing out of the Bourne culvert at Croydon does not appear to bear anything like the proper ratio which it should bear to the volume flowing immediately below the "Rose and Crown" at Coulsdon. In order to test this, the Author tried to ascertain what was the volume flowing in the Croydon sewers, but as the Corporation had recently declined to allow the sewers to be gauged, he had recourse to gauging on a dry day the effluent flowing off the sewage farm at Beddington when it was found on the undermentioned dates that the following quantities of water were flowing away.

Gauged Beddington sewage farm effluent.

Quantities flowing off.

On the	11th March,	1904,	about	17½	million	gallons	a day
„	11th April,	„	„	10½	„	„	„
„	5th May,	„	„	9½	„	„	„
„	11th May,	„	„	8½	„	„	„

Effluent is less than volume of sewage.

and as a rule the volume of effluent flowing off this farm is less than the volume flowing on to it owing to the loss from evaporation and a quantity of water flowing away to supply certain springs by leakage into the Thanet sand beds which underlie a portion of this farm. The quantity of water passing into these Croydon sewers is greater than it has ever been before, although the volume of the Bourne flow itself has not been so great as in some previous years.

Notable year for Bourne flows.

In conclusion I may say that the present year is a notable one for the appearance of Bourne flows, and wherever the chalk formation extends in the counties of Hants (including the Isle of Wight), Hertfordshire, Kent, Oxfordshire, Surrey, Sussex, and Wilts, Bournes have made their appearance in larger volume than usual.

Description of Plates.

Plate No. 1 shows a general plan of the district in which the Croydon Bourne occurs, and also the Marlpit Lane Bourne, and a longitudinal section down the Caterham Valley to Croydon, and Plate No. 2, shows in a graphic form the relative volumes of the Bournes of 1877 and 1904.

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SECTION OF CROYDON BOURNE FLOW, 1877.

Horizontal Scale 1 Mile = 1 Inch.

Furlongs 8 4 0 1 2 3 4 Miles

Vertical Scale 100 Ft = 1 Inch.

Feet 60 50 40 30 20 10 0 60 120 180 240 300 Feet

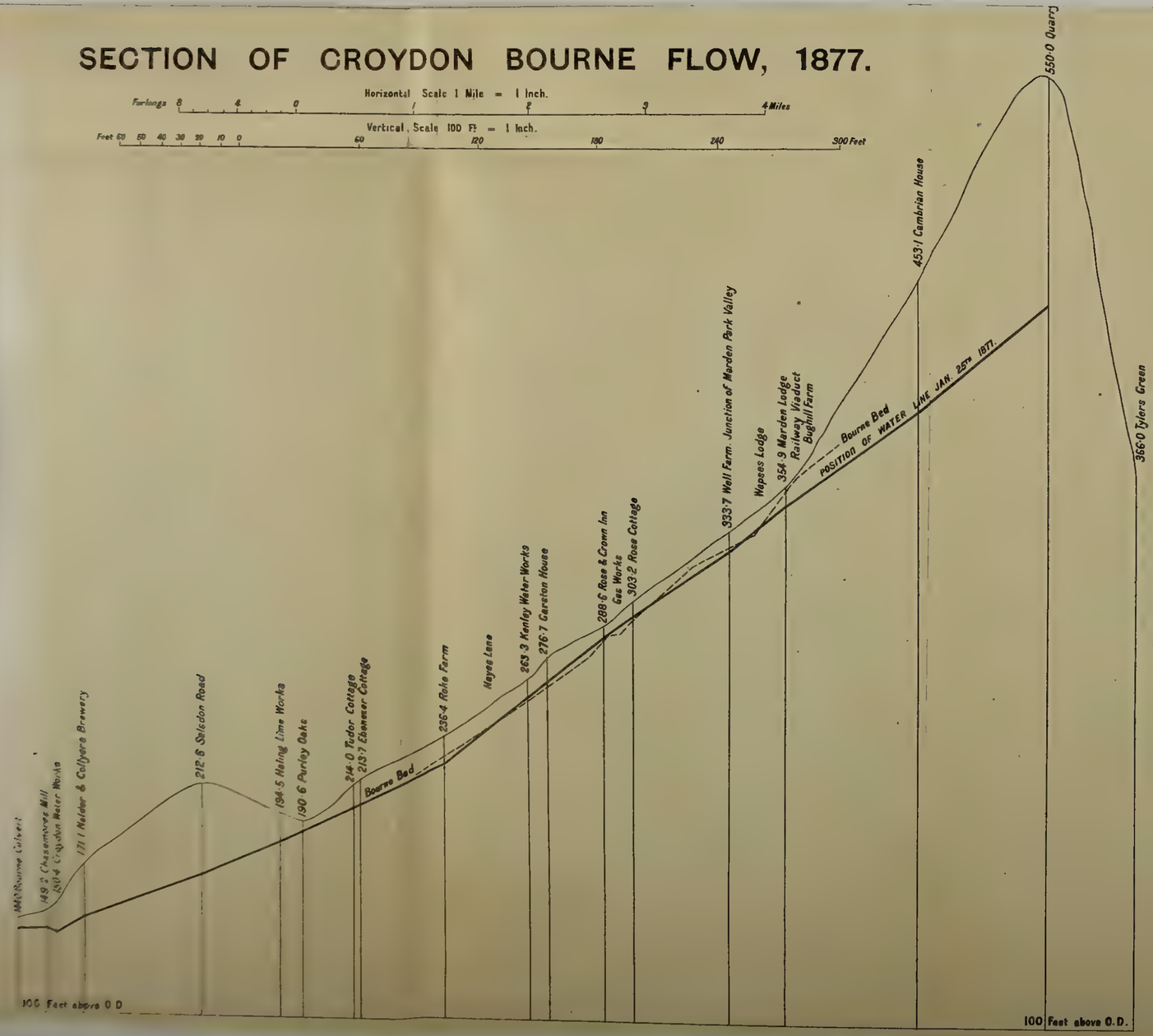


Plate Nº 1.

NOTE:– *Black lines denote Bourne Flows.*

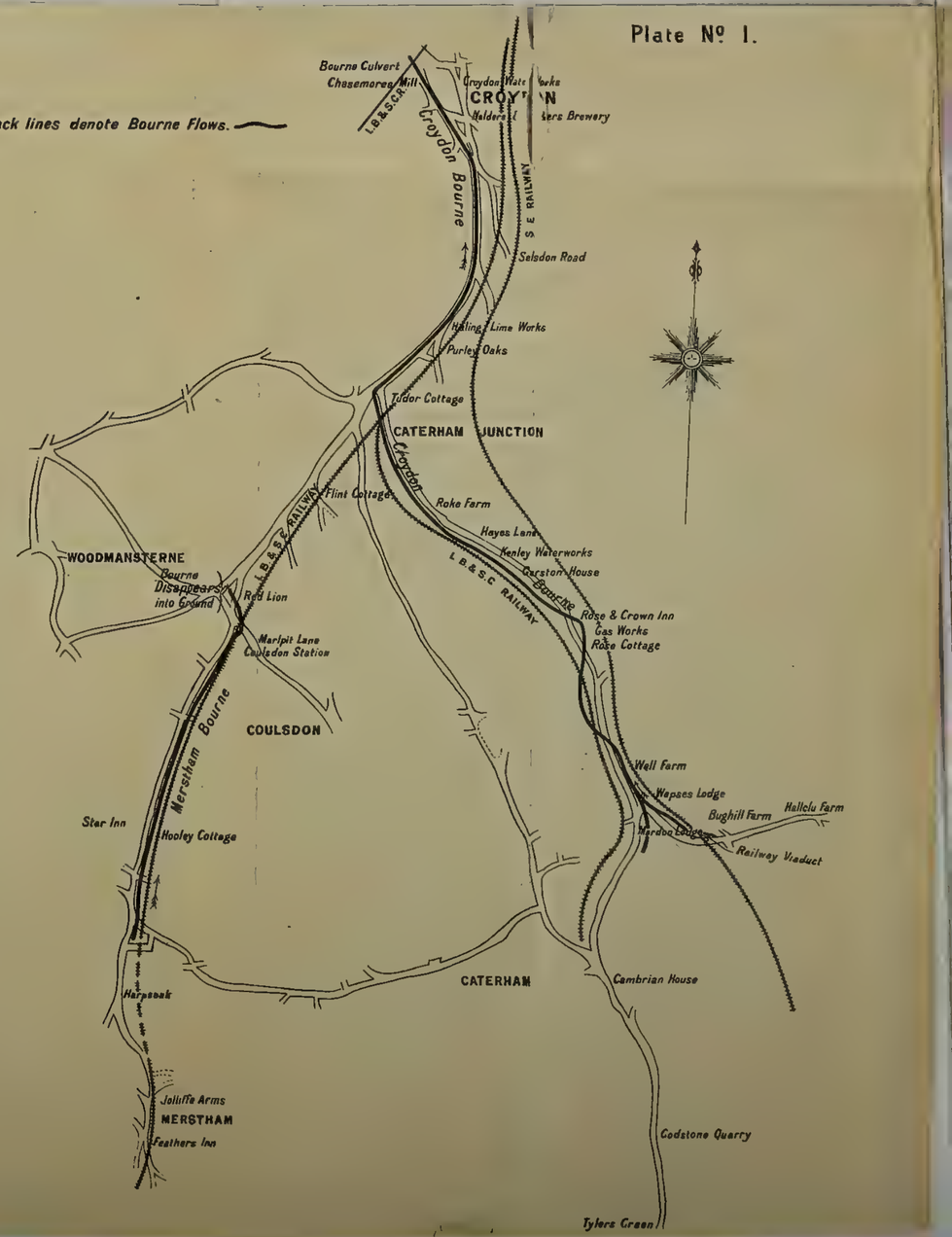
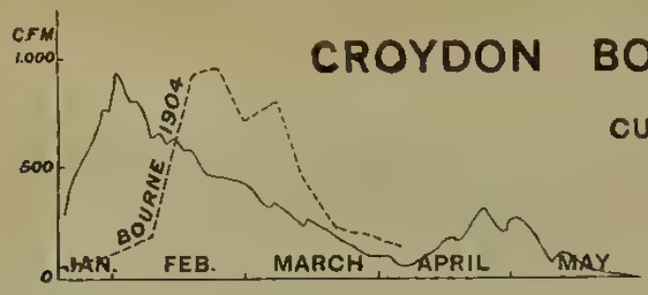


Plate Nº 2

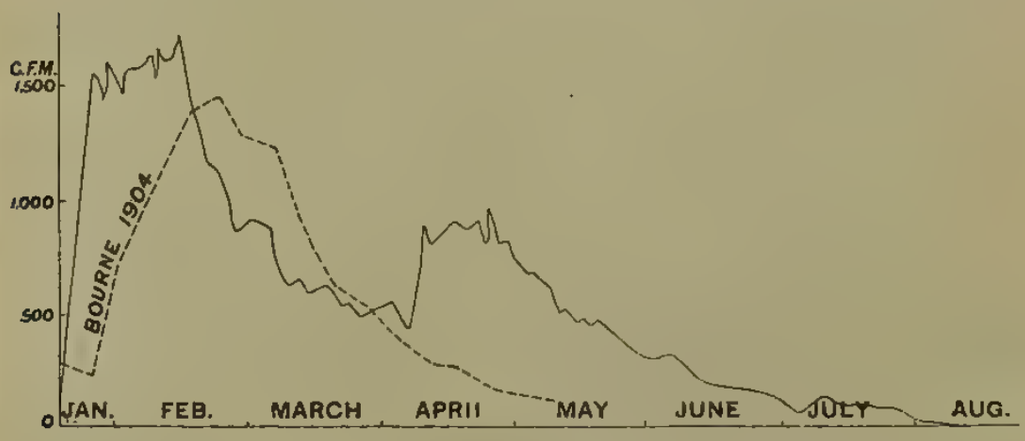
DIAGRAM OF CROYDON BOURNE FLOW, 1877 & 1904.

CUBIC FEET PER MINUTE.

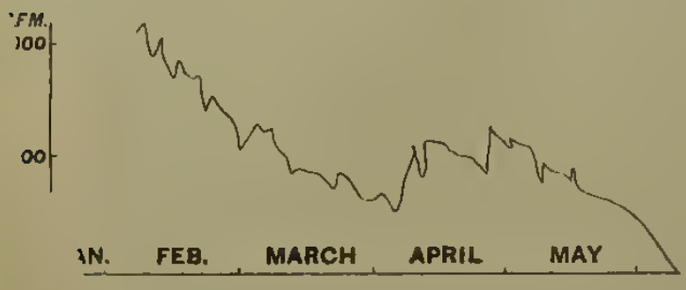


WAPSES LODGE

NEAR WARLINGHAM RAILWAY STATION

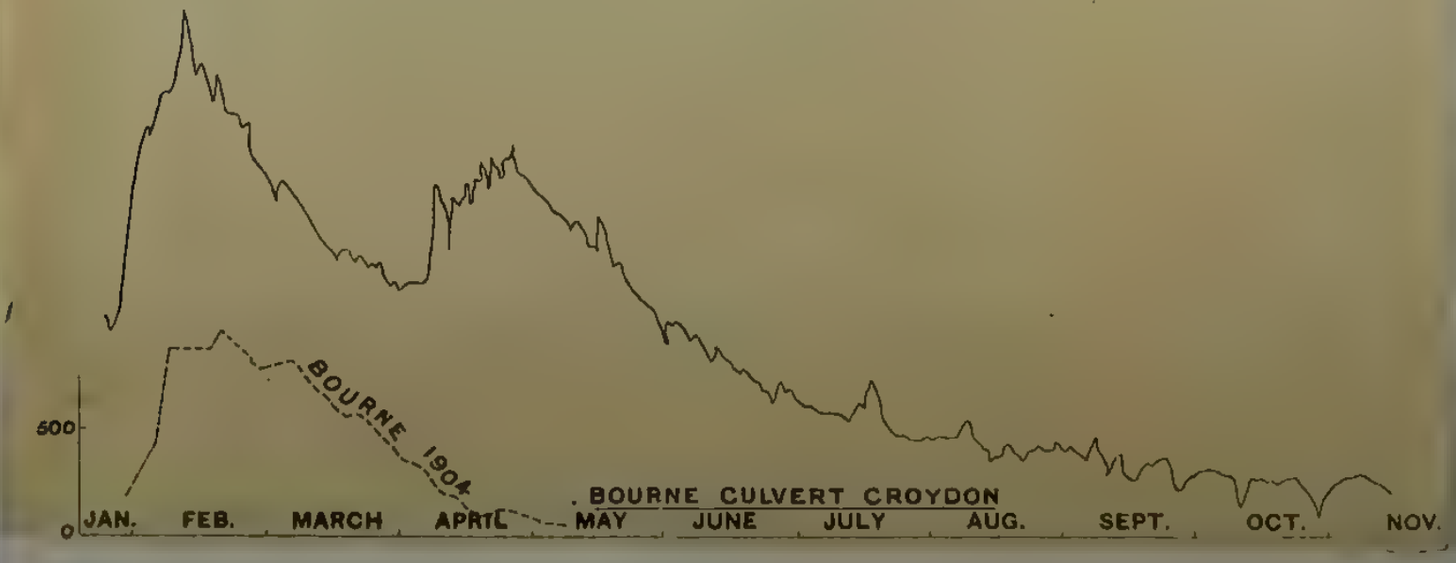


THE ROSE AND CROWN

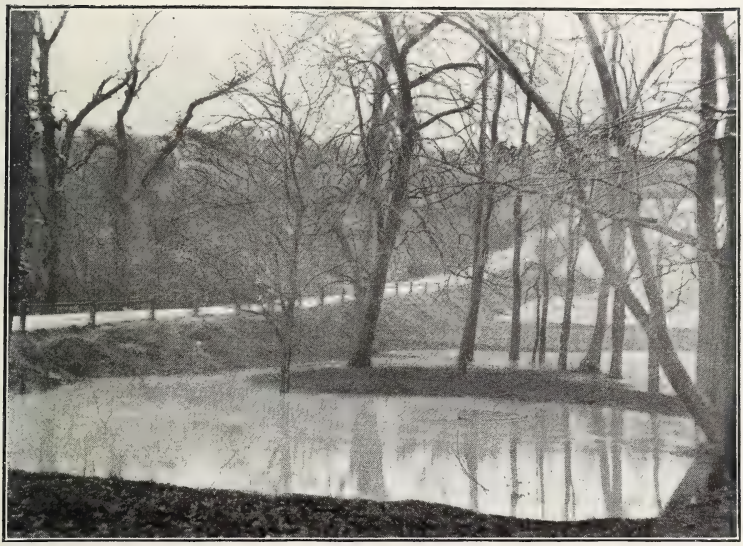


CULVERT PURLEY JUNCTION

ROYAL OAK PUBLIC HOUSE



BOURNE CULVERT CROYDON



Croydon Bourne at Wapses Lodge, February 2nd, 1904.

Croydon Bourne below "Rose and Crown," February 2nd, 1904.

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